JULY 1, 1947
American
Machinist
McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION
TECHNOLOGY DEPARTMENT
In this issue:
QUENCHING MEDIA & METHODS •
INDUCTION HARDENING FIXTURES •
PUNCH PRESSES CAN BE SAFE •

JR v.91⁴ July-Aug 1947

IT takes years for a company to build a reputation for fine engineering, for painstaking workmanship, reliable service and far-sighted vision. • We have adopted this new trade-mark to become a symbol of the reputation which we enjoy today throughout industry.

• We regard this trade-mark as a challenge--to continue improving on our past achievements, so that we may be of even greater service to our customers in the years ahead.

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ECHNOLOGY DEPARTMENT

American Machinist

MAGAZINE OF METALWORKING PRODUCTION

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Member of the Associated Business Papers and the Audit Bureau of Circulations.

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Published every other Thursday. Price 35c per copy. Allow ten days for change of address. Subscription Rates: United States and possessions, $5 a year, $8 for two years, $10 for three years. Canada, $6 for one year, $10 for two years, $12 for three years. Pan-American countries, $10 for one year, $16 for two years, $20 for three years. All other countries, $20 a year, $30 for two years, $40 for three years. Please indicate position and company connection on all subscription orders. Entered as second-class matter, August 13, 1943, at Post Office, New York, N. Y., under the act of March 3, 1879. Printed in U.S.A. Return postage guaranteed.

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PUBLISHED BY McGRAW-HILL PUBLISHING COMPANY, INC.
330 West 42nd St., New York 18, N.Y. Cables: "McGRAW-HILL, NewYork"

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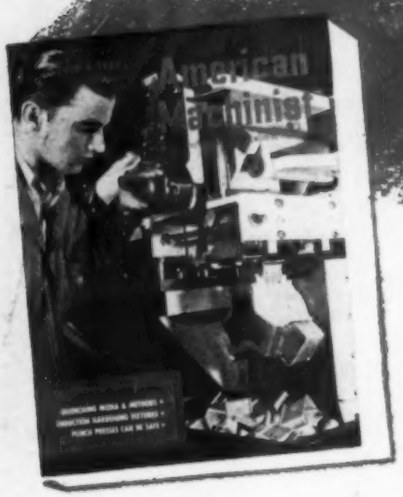


Fast Bending . . . Intricate aluminum side frames are now being produced by the new Struthers-Wells tangent bender Kodachromed on our cover. It was tooled so strip stock, fed in at the left through a progressive punch and pierce die, would pass through a 3-station bending die, one piece being produced each cycle. Specialty Equipment & Machinery Corporation were the Struthers-Wells' representatives.

Greatest Show . . . A. G. Bryant, exec. v.p. of the NMTBA, tells of importance of the forthcoming Machine Tool Show (Chicago, Sept. 17-26) as our pre-Show feature in this issue. (See biog. below)

Otherwise . . . C. L. West, v.p. of Electric Furnace Company, begins a 3-article series with design and handling for continuous electric-furnace brazing . . . Then there's a summary of Barber-Colman experience with carbide hobbing of non-metallic gears, indicating that higher initial tool cost is cut by pieces between grinds until tool cost per piece is far lower than with steel tools . . . W. A. Vollmer advocates enclosure guards for punch-press safety, shows how they work . . . John Zuber suggests retirement plans based on profit sharing, not on annual allotments.

None Forged . . . 196 letters, plus some 5000 miles of travel, were required to produce our recent (April 10 and May 8) 2-part special report on Forging. Letters since publication requesting reprints, singly and in quantity, have totalled again as many, appear to be forcing reprinting of Section I.

Quenching . . . Our special report in this issue, prepared by Associate Editor Flynn, deals with quenching media, fixtures and practice, will be joined a couple of issues from now by another on cutting fluids. Doing the two simultaneously saved some time and travel, for some sources are the same . . . Some idea of specialized quenching equipment is also given in the article on induction hardening as practiced at Jones & Lamson, with sketches made from the fixtures themselves. There old lubricant fittings, clothes-sprinkler bottle tops and the like have done yeoman service.

Ounce of Prevention . . . Fellow named Arch O. Mason at Fisher Body-Ternstedt Div., G.M., believes proper conservation is more important than salvage, so we got him to tell you in this issue something of his ideas. He'll be 58 Sept. 5, was a Cornell bachelor of chemistry back in 1912. Went with GM labs for a couple of years, then elsewhere, patented many processes, developed recovery of solder and ingot brass from auto radiators. Came back to Fisher in '41, developed tool manufacturing, conservation methods for zinc-base die-casting alloy, high-speed steel, etc.

Advantage . . . Our Detroit editor reports: "You get around and see so many new things," I am told by plant executives I meet. (They sort of envy me for it.) "Wish I would get around the way you do, but I'm so tied up with immediate problems I can't get away"—which leads me to point out that's our reason for being. We bring latest ideas and methods, save readers more hours than they spent working—and at no travel cost.

Seems to us, Chester Ricker should be in the advertising department.

Coming . . . *A.M.* for July 17 will include a dozen short articles and a special report—if we can find space for all of them. The special report, from Dr. Georg Schlesinger in England, was written in answer to the question, "Why isn't Brinell hardness a good gage of machinability?" It's pretty conclusive . . . Then there's F. S. Blackall, jr., on accelerated depreciation; tolerances at Reliance Electric; effective layout and handling; a tricky way of punching slots instead of milling them in a thin-gage cone; an exclusive on carbide inserts for blanking dies and punches; fabrication of an all-magnesium airplane; morale-building at Tinnerman Products—and so on.

VOICE OF NMTBA . . . Alexander G. Bryant was an industrial engineer for Jas. T. Ryerson & Son, Inc., for 11 years. For 8 years thereafter, he was general manager, Machinery Div. Ryerson.

Since 1931, he has been with Cleereman Machine Tool Company as vice-president, director and half the executive committee. He is also president of Bryant Machinery & Engrg. Co. In 1937-8 he was pres., Amer. Mach. Tool Distributors' Assn.; during the war on the advisory committee, Tools Div., WPB and consultant for other war agencies. In 1944, he was consultant to Will Clayton, director of Surplus Property Disposal, as well as adviser to the RFC, so prepared the report which became the first price policy on surplus. As first vice-president and director of the NMTBA, he prepared our lead article.

MACHINE TOOL SHOW

SEPT. 17-26

To visit Gleason's Booth No. 330 of the Machine Tool Show. Here, we want you to see the many new engineering developments which our engineers have incorporated into Gleason bevel gear cutting equipment to increase the productivity, accuracy and utility of these new machines.

They have developed totally new concepts in bevel gear cutting and design to further economies in the production of bevel gears or increase the efficiency of the products using these gears.

In addition, ask about the Gleason engineering service which has for so many years helped planners of equipment to obtain the best possible bevel gear drive from a standpoint of utilization and economies of production. Another reason why Gleason's offer a guarantee of more goods for more people at lower cost.

GLEASON Works
1000 University Avenue
Rochester 3, N.Y., U.S.A.

BOOTH 330

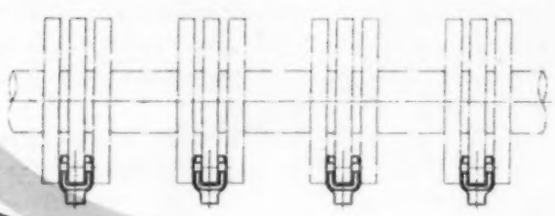
Standard Hydromatic with Standard

CINCINNATI

● Want to reduce one of the major elements of cost of your milling machine operations? Try reducing the idle machine time required for loading and unloading the work. The illustration at the right shows how this can be done with standard equipment. It's a *standard* CINCINNATI Hydromatic with a *standard* CINCINNATI Index Base attachment. Of course, the fixtures and cutter gangs were designed for the job . . . by Cincinnati Application Engineers. **Loading and unloading one bank of fixtures while the parts in the other bank are being milled, the operator of this equipment produces 228 parts per hour. Hydromatic's automatic cycles help him attain this high production.**

Other advantages include safety in loading the fixtures. There's plenty of distance between the operator's hands at the idle fixtures and the rotating cutters. The machine has the power and ruggedness necessary to mill four parts at one time from the rough. And another standard attachment — Delay Trip and Positive Stop (built into the hydraulic unit) causes the table, just before reversal, to pause long enough for the cutters to clean up the bottom of the cut.

● Of all the ways to reduce costs, *standard* machine tools offer attractive possibilities. Cincinnati manufactures an exceptionally wide variety of milling machines, all of which are illustrated in general catalog M-1420-1. You may obtain a copy by writing to our nearest agent or direct office.



Drawing of part, showing surfaces milled.
Part name—Yoke
Material—Steel
Operation—Mill slot and sides
Machine—CINCINNATI No. 4-36 Plain Hydromatic
Production—228 per hour

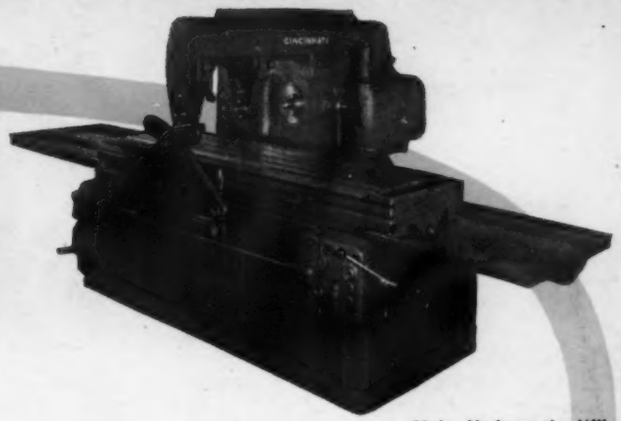
See the CINCINNATI MILLING DISPLAY at the MACHINE TOOL SHOW, Chicago, Sept. 17-26

THE CINCINNATI MILLING

MILLING MACHINES

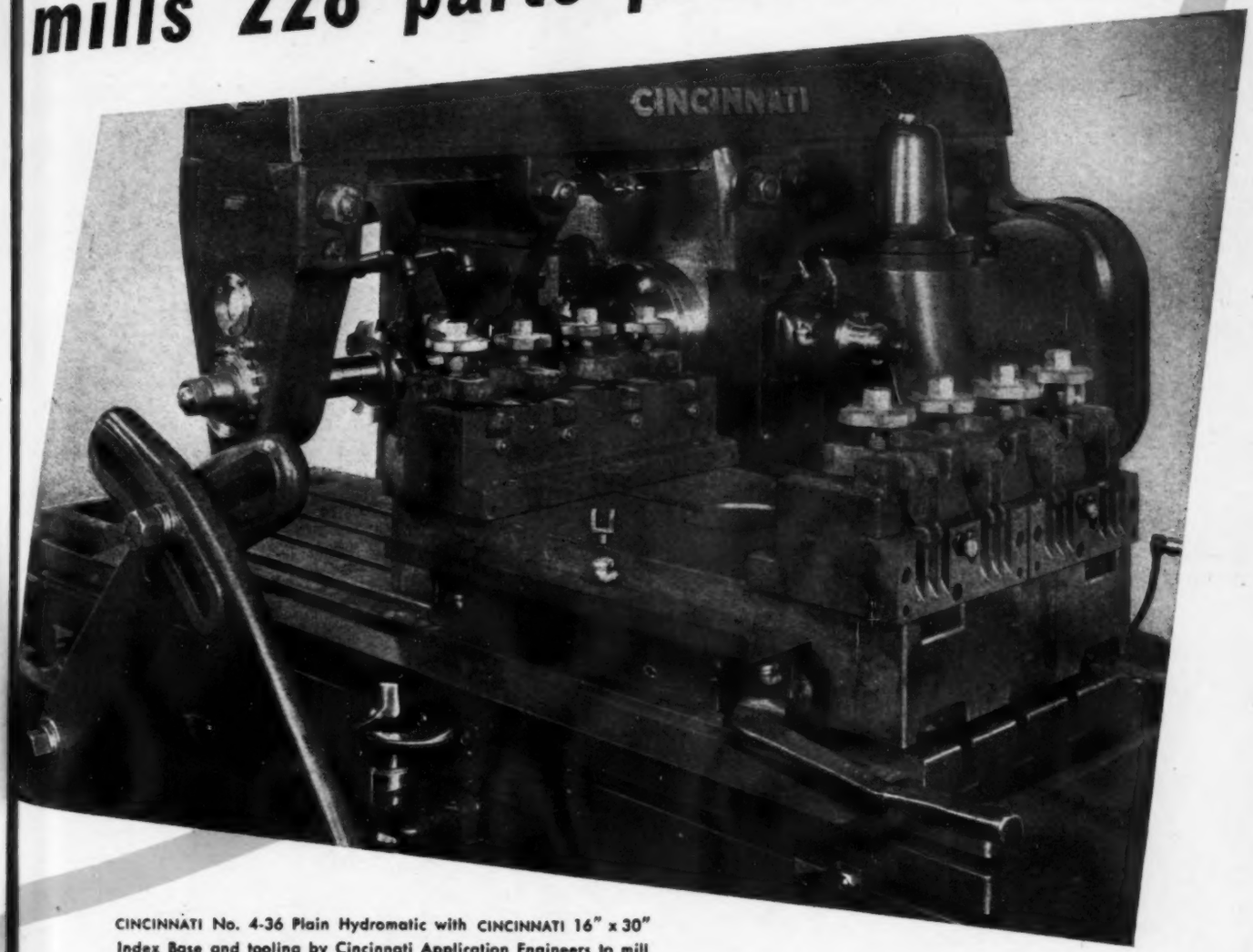
Direct field engineering offices: Boston 16, Massachusetts ● Buffalo 7, New York ● Chicago 12, Illinois ● Cincinnati 9, Ohio ● Cleveland 3, Ohio

Attachment



Plain Hydromatic Milling Machine. Also manufactured in Duplex style, and 18 sizes of each. Catalog M-1372-1.

mills 228 parts per hour



CINCINNATI No. 4-36 Plain Hydromatic with CINCINNATI 16" x 30" Index Base and tooling by Cincinnati Application Engineers to mill the slot and both sides of steel yokes.

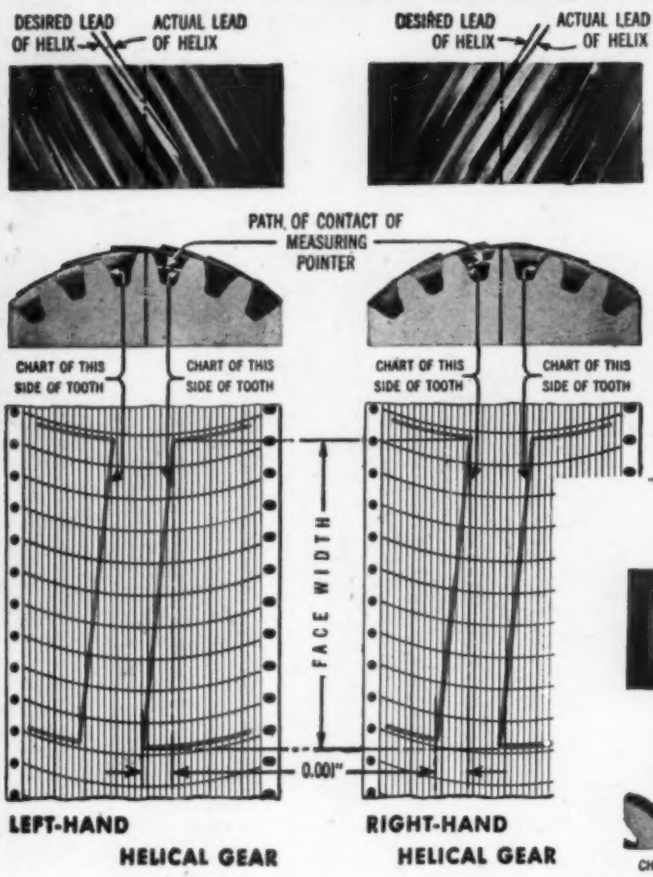
MACHINE CO. CINCINNATI 9, OHIO, U. S. A.

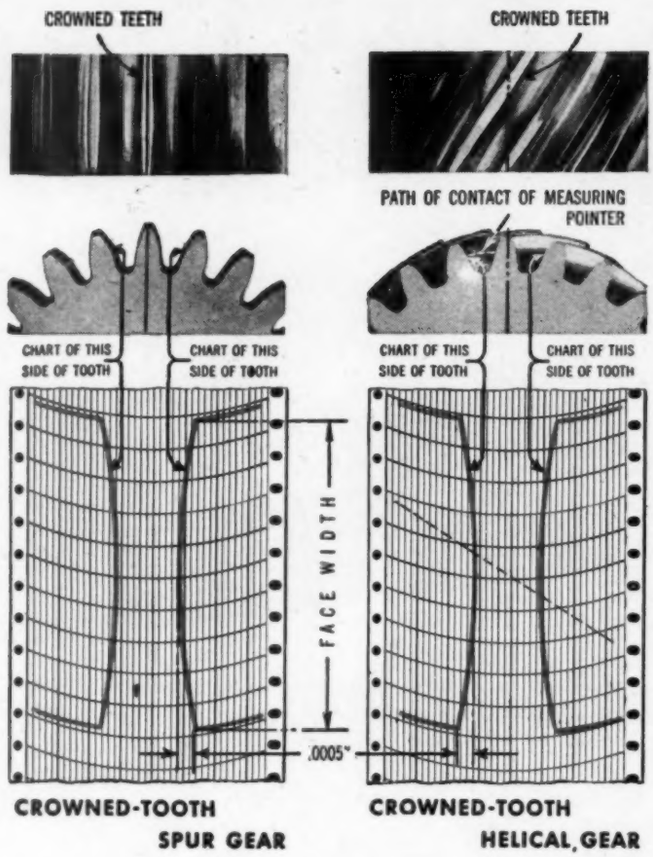
BROACHING MACHINES • CUTTER SHARPENING MACHINES

Detroit 2, Michigan ● New York 17, New York ● Philadelphia 40, Pennsylvania ● Pittsburgh 22, Pennsylvania ● Syracuse 2, New York ● West Hartford 7, Connecticut.

Graphically Charted OF LEAD, CROWN

...with the Newest

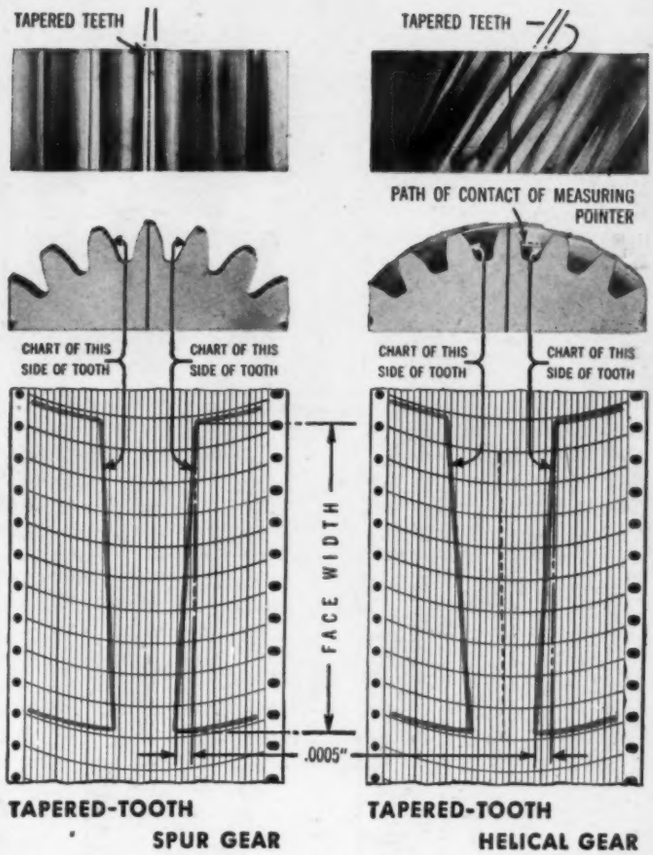

DESIRED LEAD OF HELIX
ACTUAL LEAD OF HELIX
DESIRED LEAD OF HELIX
ACTUAL LEAD OF HELIX
PATH OF CONTACT OF MEASURING POINTER
CHART OF THIS SIDE OF TOOTH
CHART OF THIS SIDE OF TOOTH
CHART OF THIS SIDE OF TOOTH
CHART OF THIS SIDE OF TOOTH
FACE WIDTH
0.001"
LEFT-HAND HELICAL GEAR
RIGHT-HAND HELICAL GEAR



THE FELLOWS METHOD...MACHINES AND TOOLS FOR

Inspection AND TAPER

Fellows Inspection Instrument



The No. 12H Fellows Lead Measuring Instrument presents an outstanding development in the art of checking gears. For simplicity of set-up and operation it cannot be equalled...a complete change in set-up, for the average gear, in less than 5 minutes!

In addition to checking by means of a one-ten thousandth dial indicator, a recorded chart graphically enlarges departures from theoretical perfection 500 times. Like all Fellows Recording Inspection Instruments, its functioning can be easily and definitely checked. The instrument by means of a master verifies its own accuracy!

This new basic Inspection Instrument is fully explained and illustrated in a circular awaiting your request. The Fellows Gear Shaper Company. Head Office and Export Dept., Springfield, Vermont, U.S.A. Branch Offices...616 Fisher Bldg., Detroit...or 640 West Town Office Bldg., Chicago.

Fellows

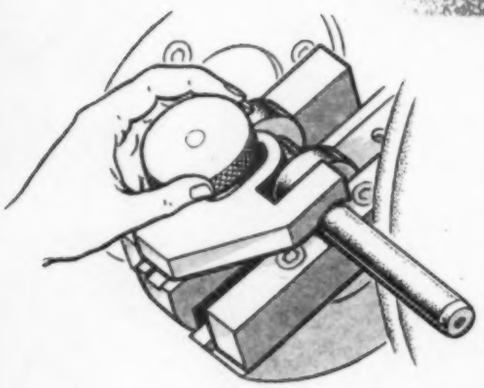
ALL OPERATIONS FROM BLANK TO FINISHED GEAR

CINCINNATI

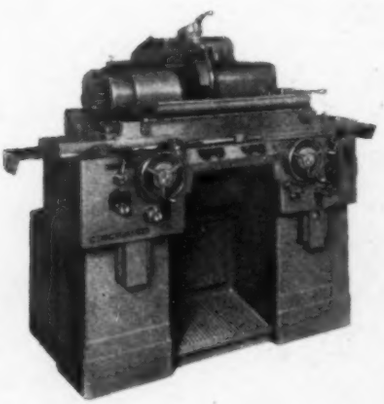
thumbs up

ON THIS FIXTURE

FOR SAFELY LOADING AND



This drawing illustrates the convenience of loading and unloading the fixture. The operator's hand is always on top.

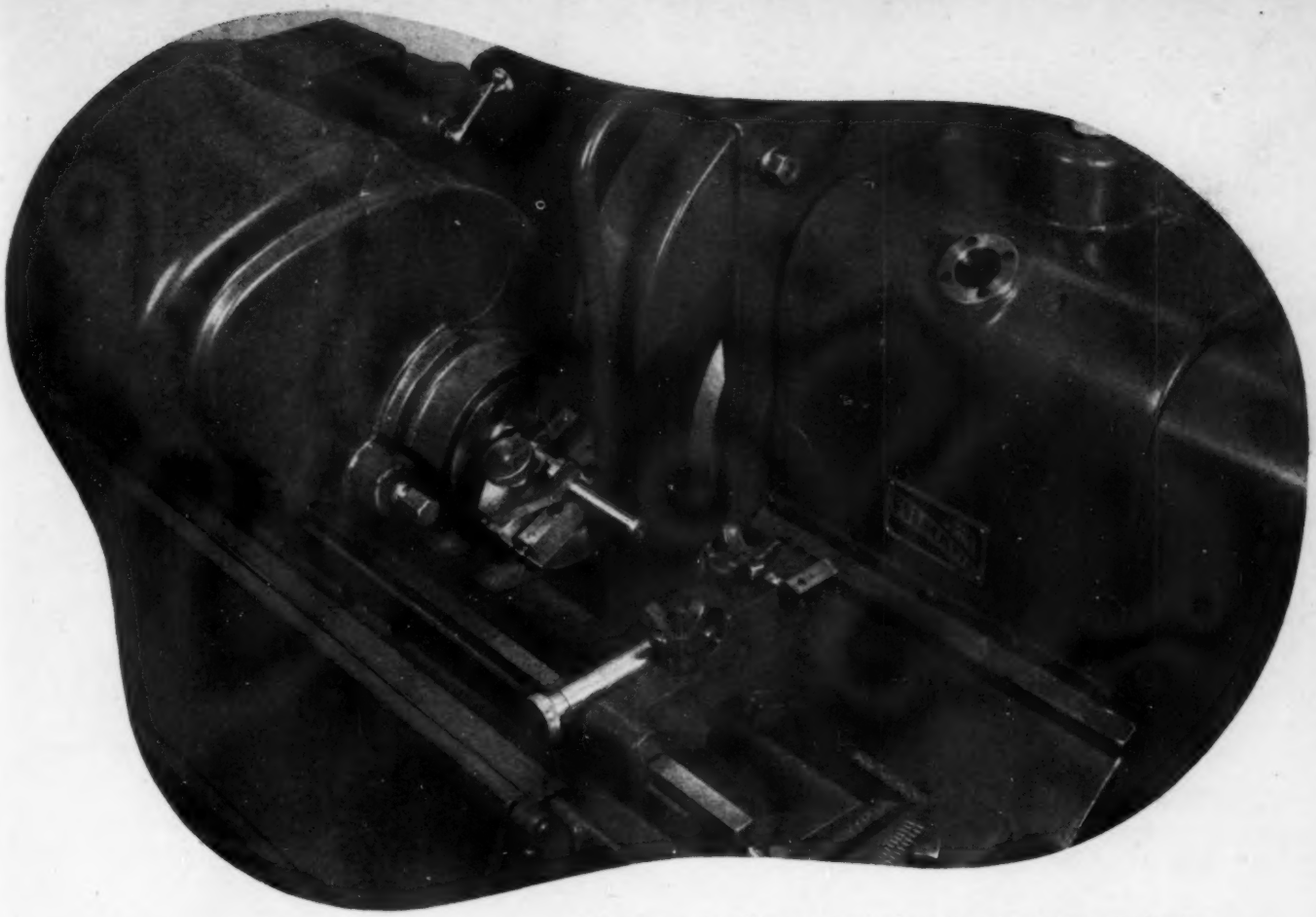


CINCINNATI FILMATIC 4" Plain Hydraulic Grinder. Complete specifications may be obtained by writing for catalog G-551.

See the CINCINNATI GRINDERS DISPLAY at the MACHINE TOOL SHOW, Chicago, Sept. 17-26

CINCINNATI GRINDERS

CENTER TYPE GRINDING MACHINES



Close-up of CINCINNATI FILMATIC 4" Plain Hydraulic Grinding Machine, showing fixture developed by Cincinnati Application Engineers to grind an eccentric diameter on a small crankshaft.

UNLOADING ECCENTRIC GRINDING JOB

● Three problems were involved in grinding an eccentric diameter on the long end of a small crankshaft.

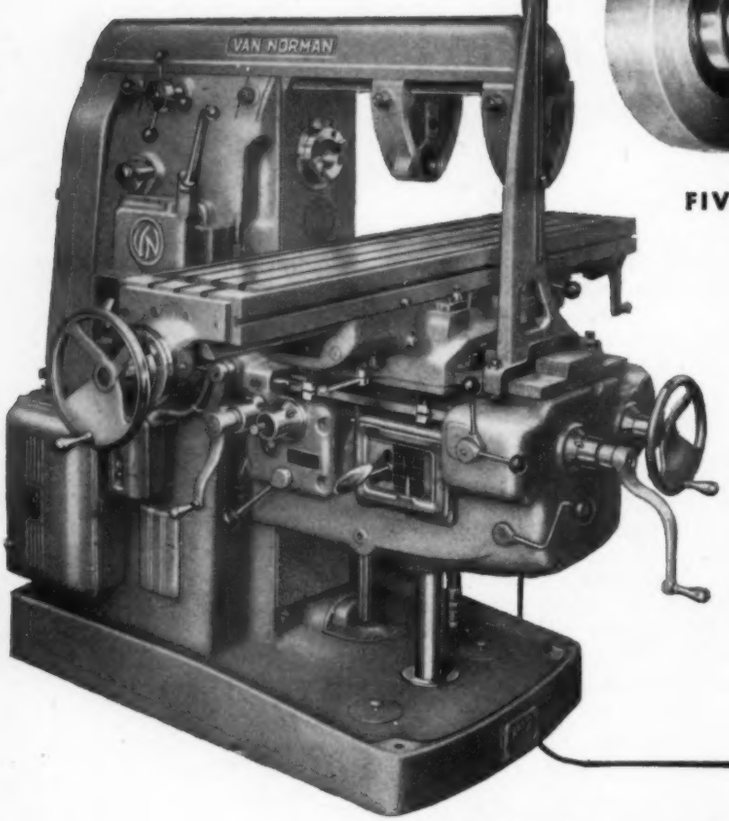
1. The part required a fixture to locate the eccentric diameter in proper relation to the crank section, and to hold the part while it was being ground.
2. To meet production requirements, easy, safe and quick loading and unloading was desirable.
3. The machine had to be small and compact to save valuable floor space, yet powerful enough to meet the requirements of stock removal.

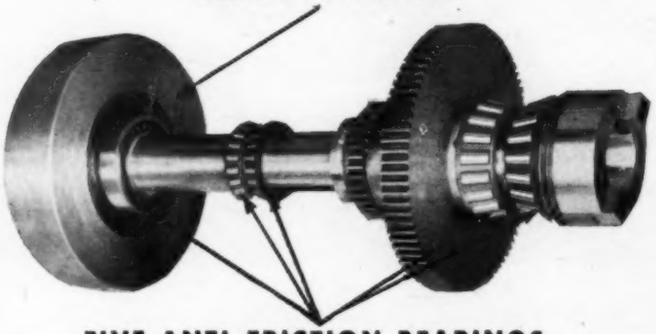
Cincinnati Application Engineers assigned the job to a CINCINNATI FILMATIC 4" Plain Hydraulic Grinder with live spindle headstock, and equipped the machine with a special work holding fixture, above. The headstock electrical controls are arranged to consistently stop the headstock spindle at the same spot within a few degrees. This assures easy and quick loading and unloading, for the fixture clamp and clamping nut are always on top; it's safe; no time is lost in jogging for position. Almost .050" stock must be removed, practically all of it from one side of the ground diameter. The machine handles this heavy stock removal without a whimper, thanks to FILMATIC spindle bearings and other Cincinnati features. Automatic infeed is built into the machine to further aid production and eliminate operator fatigue. ¶This is one of the many ways in which Cincinnati Application Engineers have been helping all types of industry to increase production of their precision ground parts. They have the know-how to help you, too. Why not submit your grinding problems to them?

INCORPORATED CINCINNATI 9, OHIO, U. S. A.

CENTERLESS GRINDING MACHINES • CENTERLESS LAPPING MACHINES

Built-In Spindle Flywheel Provides Greater Cutability, Increases Versatility of VAN NORMAN Horizontal Milling Machines





Spindle Design of New Van Norman No. 2 Heavy and No. 3 Standard.

5 anti-friction bearings . . . double-opposed in front, double-opposed center and single in rear . . . support the large alloy steel spindle. They assure maximum spindle strength and rigidity under all cuts. Heavy flywheel improves cutability.

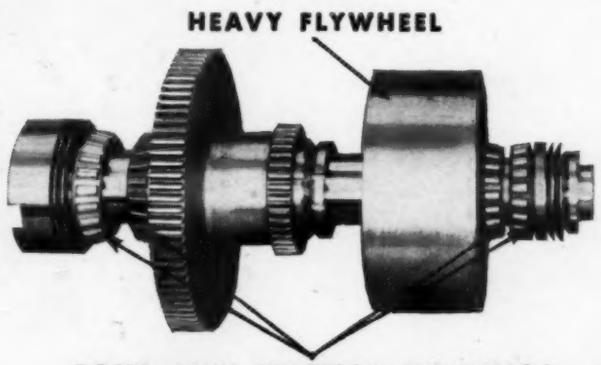
"It Pays to Van Normanize" VAN

ONE of the many reasons why Van Norman Horizontal Milling Machines give such outstanding performance is the built-in spindle flywheel.

This heavy flywheel, mounted inside the column, plus the large bull gear provides smooth, uninterrupted transmission of power to the cutter. Not only does this design increase cutability of the machine but it also improves the quality of work by assuring smoother finish of the work.

Van Norman Horizontal Milling Machines give you these additional advantages—front and rear controls of all power feeds including six-way rapid traverse . . . single lever speed selectors . . . large, easy-to-read dials . . . hardened alloy steel gears with larger than normal tooth area . . . automatic lubrication, alloy steel multi-splined shafts and anti-friction bearings throughout.

Investigate Van Norman Horizontal Millers, today. They are available in many models with plain or universal saddles.



Spindle Design of Van Norman No. 2 Medium.

Double-opposed front and rear bearings provide rigid support for the spindle. Large flywheel plus heavy bull gear increase cutability and versatility and improve finish of the work.

VANORMAN COMPANY

SPRINGFIELD 7, MASSACHUSETTS

For

The LANDMACO Threading Machine equipped with the LANCO Head will give you quality threads at low operating cost.

The LANDMACO machine illustrated is used to thread tail wheel bolts and other precision aircraft parts that must be held to rigid tolerances.

It can readily be set up to handle all types of bolt or pipe threads and it assures smooth-finished well-formed threads of class 3 fit on the toughest alloy steel.

If you require threading accuracy and high production, let us tell you how LANDMACO machines have solved these problems for hundreds of manufacturers.

Write for Bulletin H-75
containing complete specifications
of the LANDMACO Machine

LANDIS
REG. U.S. PAT. OFF. TRADE—MARK

1947 MACHINE TOOL SHOW CHICAGO

LANDIS

Precision Threading . . . . . .

THE LANDMACO

THREADING MACHINE

S MACHINE CO. WAYNESBORO PENNA. U.S.A.

"Engineered Grinding Service"

Saves Special Machine Cost ..... Gives Faster Delivery

by modifying a standard grinder for a special job

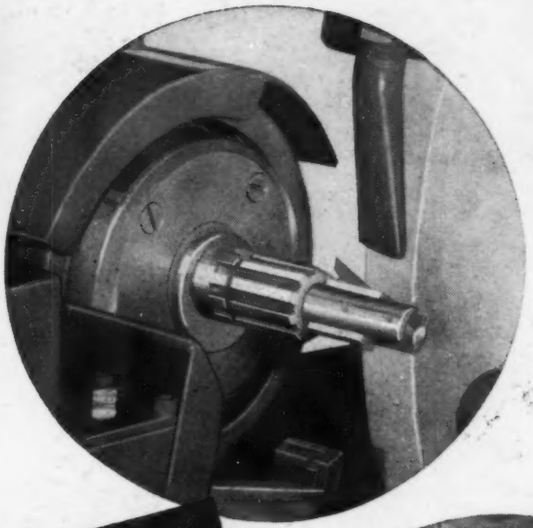
Modified 6" x 18"
CH Plain Hydraulic Grinder

EQUIPPED WITH MICROSPHERE BEARINGS

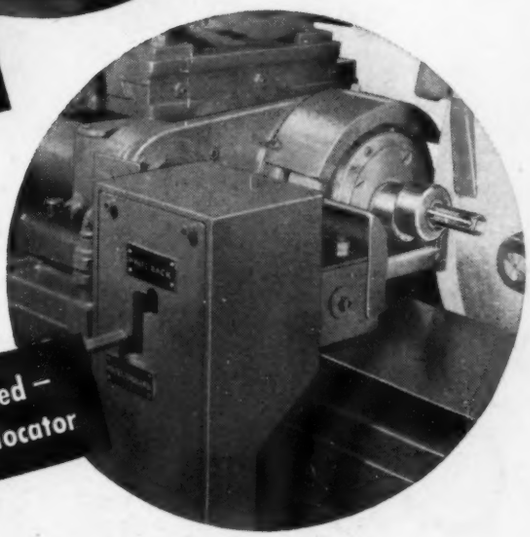
LANDIS TOOL

Precision Grinders

Grinding hydraulic pump cams



Off center work holding fixture



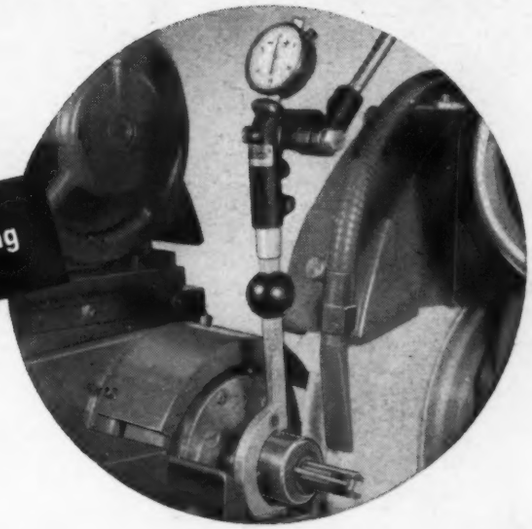
Hydraulic rapid infeed – Bed mounted work locator

STANDARD FEATURES

Two Speed Hand Traverse
Microsphere Bearings
Hand or Automatic Wheel Feed
Dual Cylinder Hydraulic Traverse

SPECIAL MODIFICATIONS

Off Center Work Holding Fixture
Visual Sizing
Hydraulic Work Holding
Live Spindle Headstock
Reciprocating Mechanism
Hydraulic Rapid Infeed
Bed Mounted Work Locator



Visual Sizing

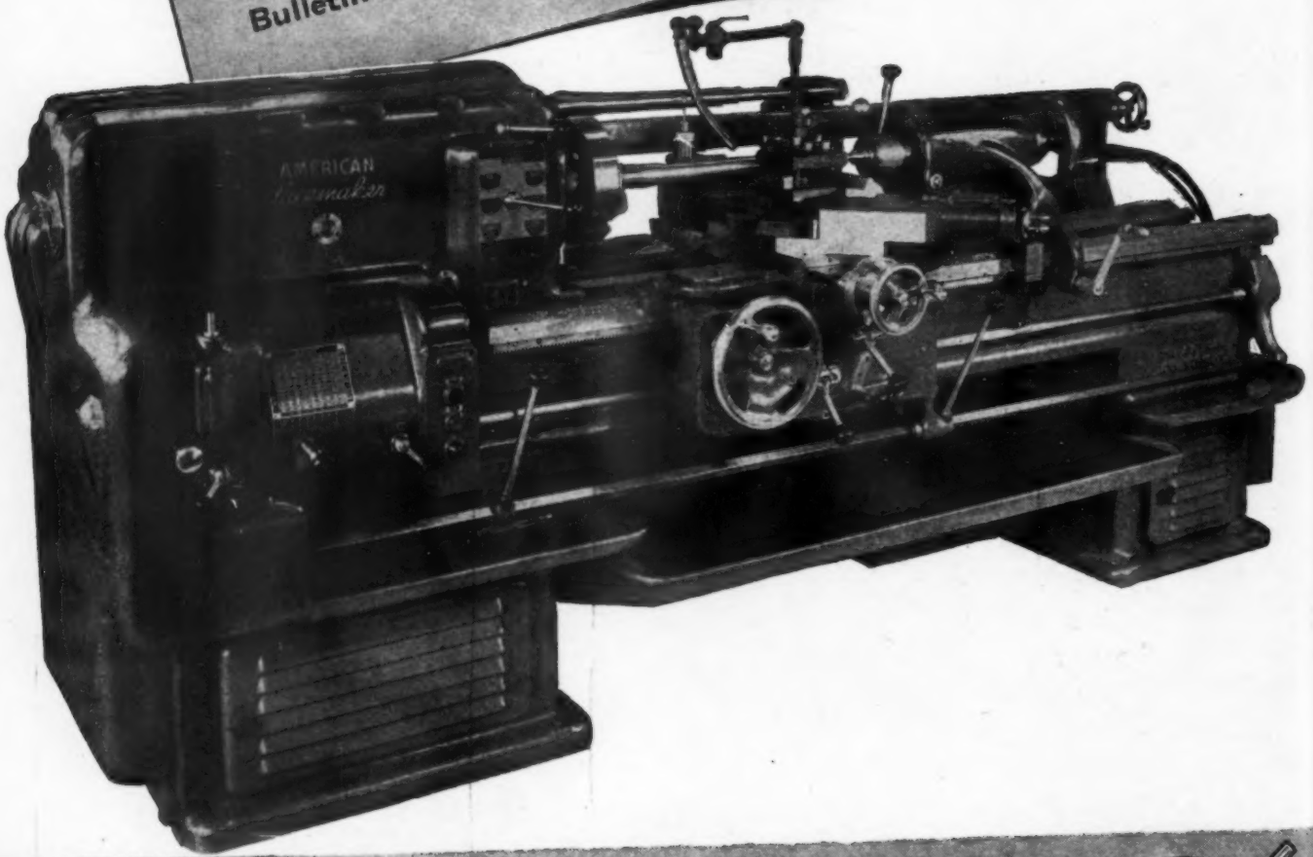
LANDIS TOOL COMPANY, WAYNESBORO, PENNA.

SHAFT PRODUCTION COSTS *hit a new low*

The new "American" "H S-D" (Hydraulic Shaft-Duplicating) Lathe presents to the metal-working industry a new and revolutionary technique for the production of various types of shafts. Other methods are now outmoded by this new development. Production costs have hit a new low. Piston rods that formerly took over 4 hours are now produced on this lathe in 36 minutes.

Write for descriptive literature—Bulletin No. 35.

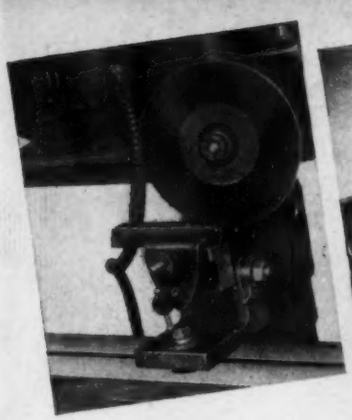
This shaft is being machined complete; floor to floor time, 18 minutes.

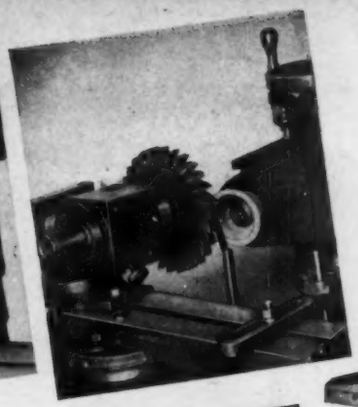


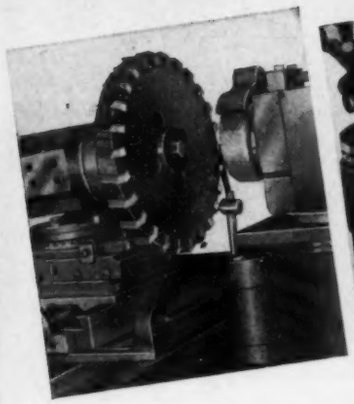
THE AMERICAN TOOL WORKS CO.

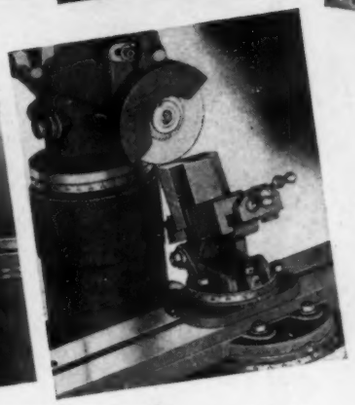
Cincinnati, Ohio, U. S. A.

Lathes and Radial Drills









TOOL JOBS COST LESS ON A NO. 12

UNIVERSAL CUTTER AND TOOL GRINDER

For a wide range of toolroom work here's a grinder with the universal utility and long-life precision which will mean savings for your operation. It's a rugged, dependable machine — a development of years of tool grinding experience. It will do more jobs, better — and at less cost. That's why the COVEL No. 12 is in more toolrooms today than ever before — why it will pay you to see how the No. 12 can help you lower toolroom costs. Write today.

This bulletin No. A-157 gives complete details on the No. 12 and attachments. Ask for it today or see your nearest COVEL dealer.

IMMEDIATE DELIVERIES!

COVEL MANUFACTURING CO.
BENTON HARBOR, MICHIGAN, U.S.A.

COVEL
INDUSTRIAL GRINDERS

DETROIT PUBLIC LIBRARY

MORSE
Spring Tempered Shank has high tensile strength to absorb torsional stress and shock.
Super High Speed Steel Head is butt-welded on shank, for greatest cutting action.
Note Expansion Feature which allows compensation for wear—giving long life to cutting head. Hollow head adjusting screw is countersunk to permit grinding upon centers.
No. 1734
TAPER SHANK
No. 1733
STRAIGHT SHANK

Like Tabby...

MORSE *Expanding Chucking* REAMERS

have more than One Life

...and Longer Life per grind when reground

You're looking at a reamer that can really take on a volume of work! Due to its *expansion* feature, it can be reground and reground each time it's worn slightly below size. The cutting head is Super High Speed Steel —butt-welded onto a spring tempered shank. Result: An expanding chucking reamer designed for rugged duty, long life and maximum cutting efficiency.

Morse makes a full line of reamers that will do every reaming job to your tolerances. Over 80 years of Morse engineering know-how pays off, too, in drills, cutters, taps, dies and special tools that step up volume and lower your costs. Your Industrial Supply Distributor can obtain the Morse recommendation that fits the tool to *your* job.

Accuracy, Quality, Uniformity: the MORSE Code of Cutting-Tool Manufacture

MORSE TWIST DRILL & MACHINE COMPANY

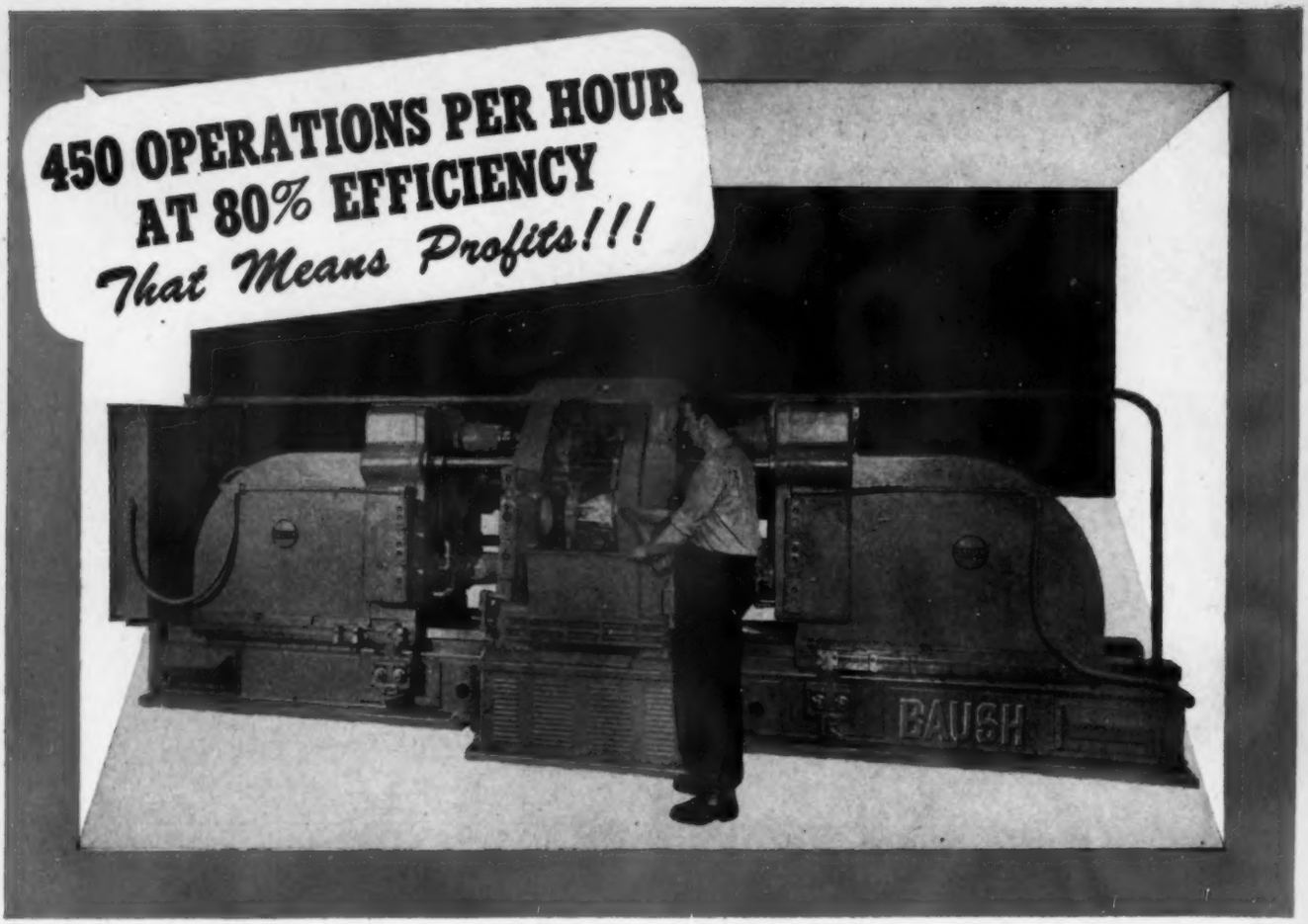
The Original Manufacturer of Twist Drills

NEW BEDFORD, MASSACHUSETTS

York Store: 130 Lafayette St. • Detroit Store: 2952 East Grand Blvd. • Chicago Store: 570 West Randolph St. • San Francisco Store: 1180 Folsom St.

450 OPERATIONS PER HOUR AT 80% EFFICIENCY

That Means Profits!!!



Yes — and that is why Baush Multi-Spindle single purpose machine tools, such as this Baush 2-Way Horizontal Boring Machine — designed and built to speed production economically and efficiently — have led this field for over 50 years

Our engineers will be glad to help solve your production problems — send them to us now.

Specifications:

Baush 2-Way Horizontal Multiple Spindle Boring Machine

Consists of two (2) hydraulic units with separate head saddles and hardened steel ways

Two (2) fixed center heads, each furnished with 3 spindles of precision preloaded type and with flange drives

Two (2) separate hydraulic systems, each with dwell in feed

2 – 15 H.P. 1800 R.P.M. motors for spindle drives

2 – 2 H.P. 1200 R.P.M. motors for hydraulic pump drives

A 4-station trunnion type fixture is arranged to accommodate one (1) Rear Axle Differential Carrier at each station. Part locates on finished flange and 2 dowel holes. Interlocking bars between machine heads and trunnion fixture locate the rotary index and guide the alignment of fixed center heads for precision stub nose spindles. Fixture arranged for hydraulic index.

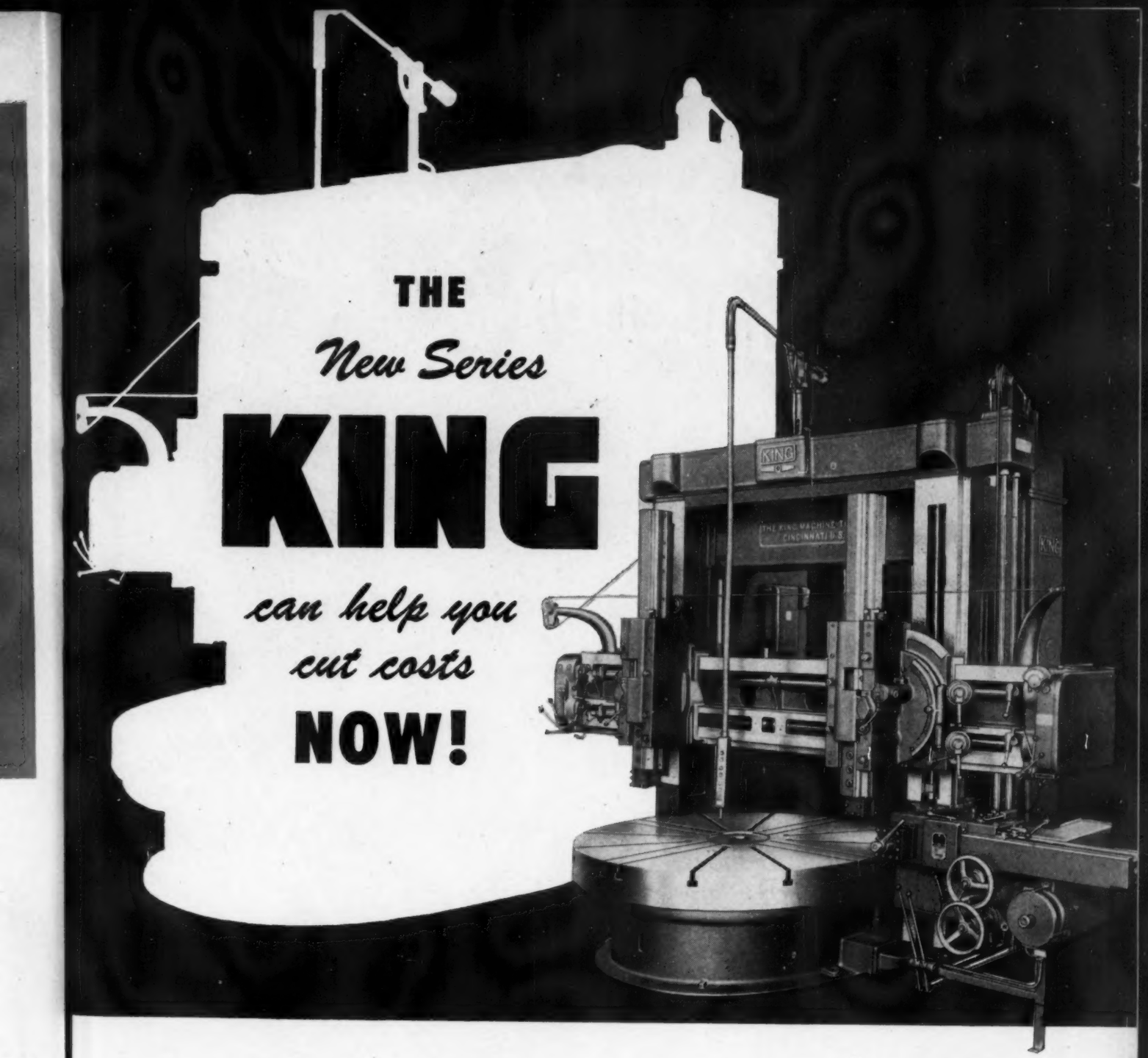
Part — Automotive Rear Axle Differential Carrier.
Operations — Boring Pinion Holes.

SEQUENCE OF OPERATIONS

1st Station: — Unload and load one part
2nd Station: — Rough bore and face
3rd Station: — Semi-finish bore and chamfer
4th Station: — Finish bore

Production: — 45 parts per hour at 80% efficiency.

BAUSH
MACHINE TOOL CO.
SPRINGFIELD 7, MASSACHUSETTS



● If you are one of the many manufacturers concerned about making cost reductions to meet competitive situations—you will be interested in the new series King Vertical Boring and Turning Machine.

Here is a substantially heavier machine with all the power—speed—rigidity required for the successful and economical use of carbide tools.

You will also be interested in the convenience of control—all operating controls are at the front within easy reach of the operator in his normal working position.

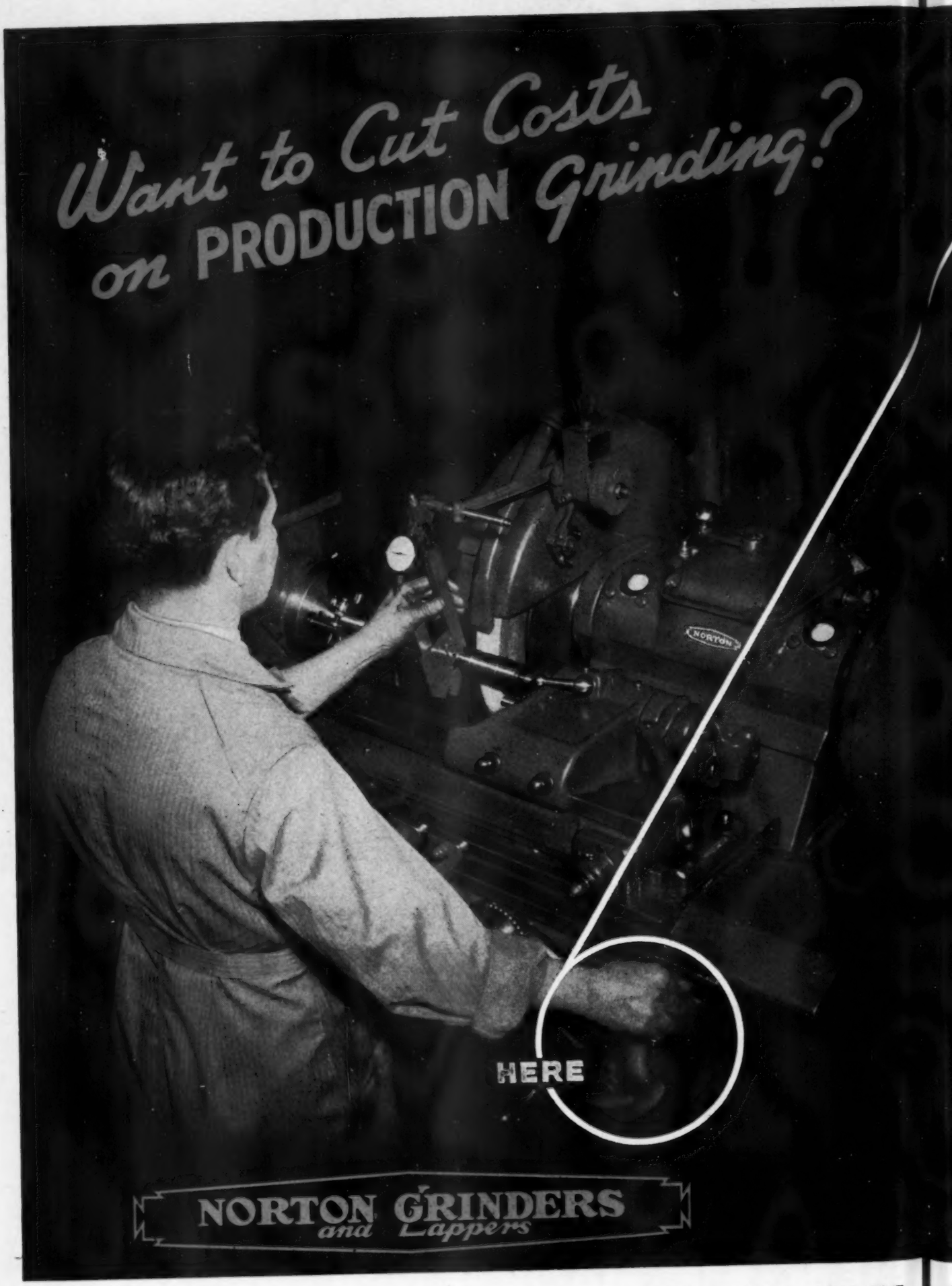
In addition they have a wide range of speeds —high or low to meet every operating need within sound engineering standards.

Experience has proved the machine capable of the heaviest cuts at highest speeds modern cutting tools will stand. You can rely on the new series King for higher production—precision work—lower costs.

Available in ten sizes 30", 36", 42", 52", 62", 72", 84", 100", 120" and 144".

THE KING MACHINE TOOL COMPANY
CINCINNATI 29, OHIO
Builders of Vertical Boring and Turning Machines Exclusively

1947


Want to Cut Costs
on PRODUCTION Grinding?
NORTON
HERE
NORTON GRINDERS
and Lappers

The NORTON Semiautomatic with ONE LEVER CONTROL is the answer!

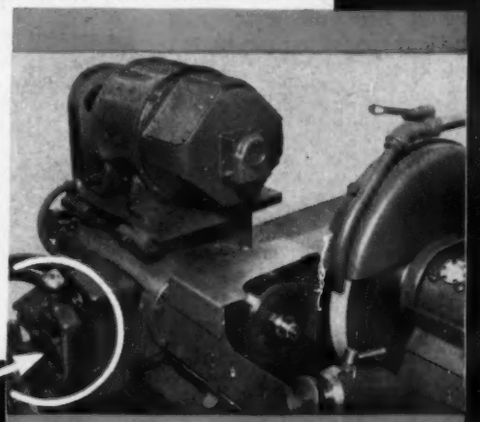
YES . . . . The NORTON SEMIAUTOMATIC with its ONE LEVER CONTROL feature does cut costs on production grinding because . . . .

- It directs all functions of the grinding cycle — except applying or removing a gage.
- It reduces operating effort to a minimum, permitting the grinder hand to devote principal attention to getting work into—and out of—machine.
- It preserves and protects his efficiency by greatly reducing normal operating fatigue.
- And finally—because it promotes higher output with less effort—it greatly reduces work unit cost.

ONE LEVER CONTROL is available on NORTON 4" - 6" - 10" Semiautomatics. Write for catalog on the size required.

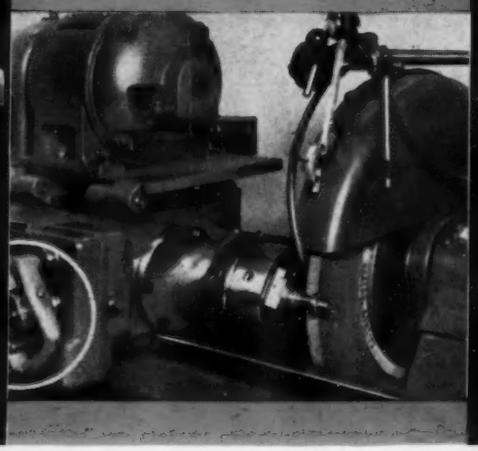
NORTON COMPANY, WORCESTER 6, MASS.
New York - Chicago - Detroit - Cleveland - Hartford
Distributors in All Principal Cities

M-545



or HERE

With Live Spindle Attachments on NORTON Semiautomatics — with or without chucking arrangements — the ONE LEVER CONTROL of all grinding cycle functions is retained — but for greater loading convenience the lever is mounted on the work head.



THIS IS DUPLITROL . . .

. . . FOR MAKING REPETITIVE PARTS *WITHOUT JIGS!*

2 ¾ x ¾ C.R.S. **BARS** *ONE* **HORIZONTAL** *ONE* **VERTICAL** . . . with ¼" holes machined at the desired spacing.

+ **2** **HARDENED PINS** . . . used to select locations according to the desired pattern of holes.

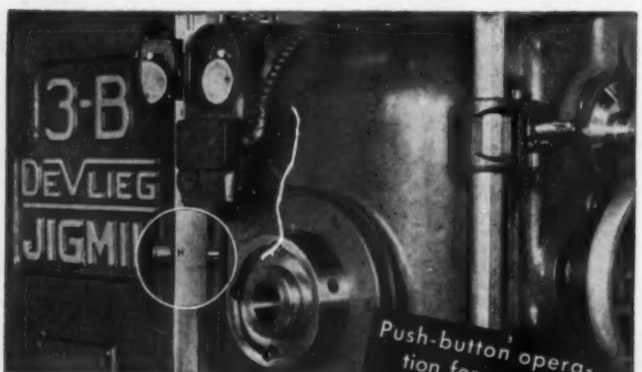
+ *Automatic* **POSITIONING** . . . accurately and dependably provides foolproof spacing for machining repetitive parts *without jigs.*

= DUPLITROL by DeVLIEG

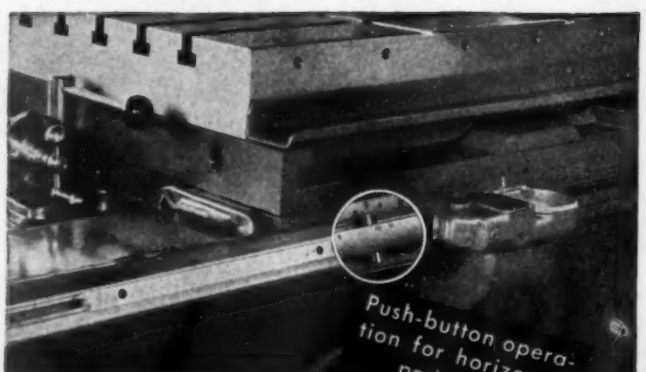
The finest known process for accurately spacing and machining holes.

THIS IS HOW IT WORKS . . .

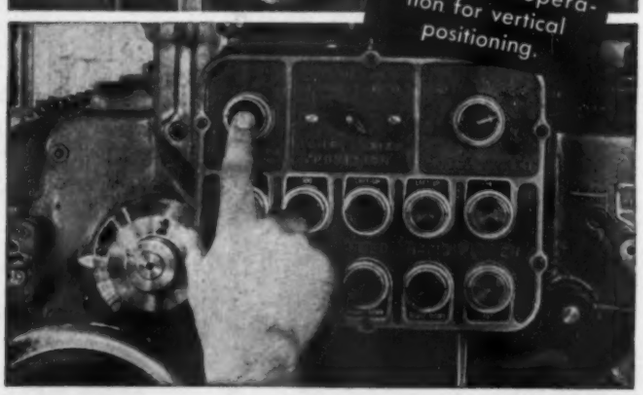
Illustrated at right is one vertical bar and one horizontal bar with pins used as masters on the 3B DeVlieg Duplitrol Equipped Jigmil. Below are illustrations showing how all spacing is done in response to push-button operation.

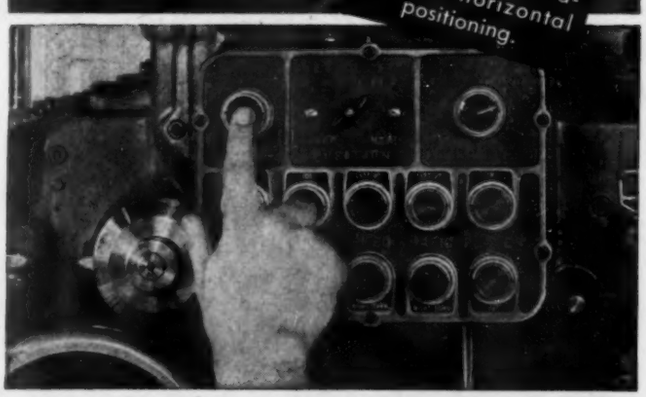


Push-button operation for vertical positioning.



Push-button operation for horizontal positioning.



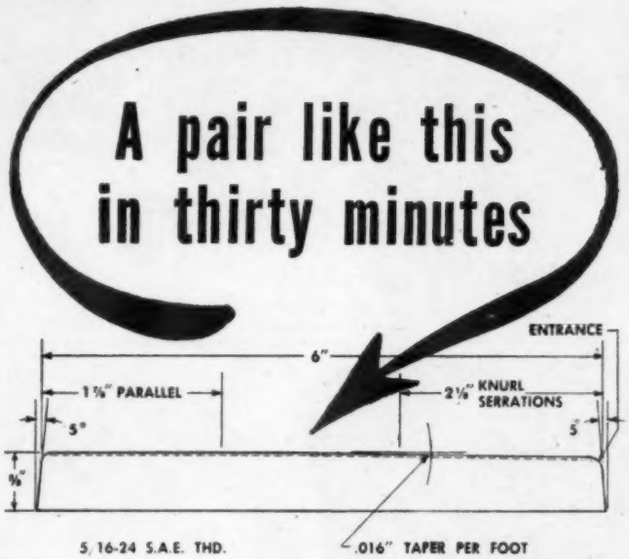


DeVLIEG MACHINE COMPANY — DEVLIEG JIGMIL — 450 FAIR AVE. FERNDALE 20, (Detroit) MICH.

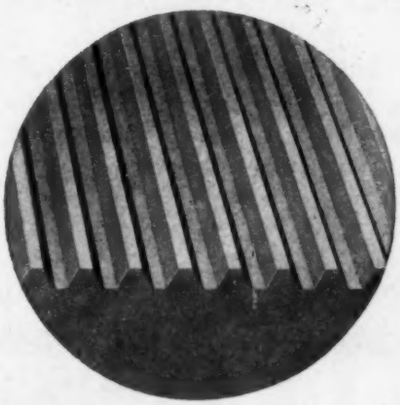
GRIND thread rolling dies?

...*the answer is* **YES!**

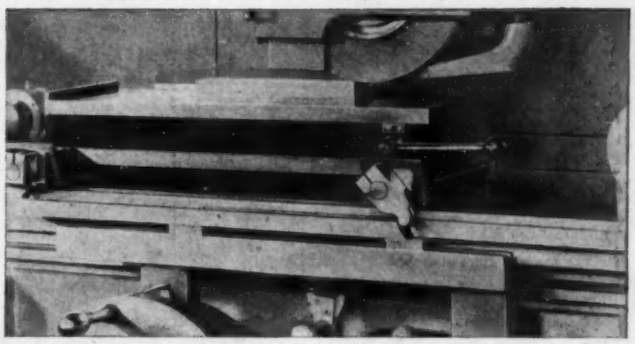
Now—through a new application of THOMPSON TRUFORMING—you can produce accurate duplicate roll thread dies and eliminate subsequent corrective operations formerly required. An example is the roll thread die shown here.



This is the Stationary Die (a perfect mate to the Moving Die not shown). Both were ground on a THOMPSON TRUFORM grinder from heat-treated alloy steel in less than thirty minutes. Note the radii, the precise taper and flat section. This is produced with a single cut—to full depth of thread form without resetting.



Enlarged tooth section shows form of threads and helix angle. By TRUFORMING dies are perfectly matched . . . there is no distortion.



Deformities are eliminated by TRUFORMING because work is finished right in hardened steel. Note the special forming fixture in the photograph, which makes possible completely automatic and highly accurate grinding of the longitudinal contour. These Thompson die grinding features are new with patents applied for.

Longer die life and greater die accuracy, plus ability to regrind dies without drawing, are three great advantages you get with this THOMPSON TRUFORMING application.

Write at once for complete details . . . Address Dept. 12.

The Thompson Grinder Company • Springfield, O.

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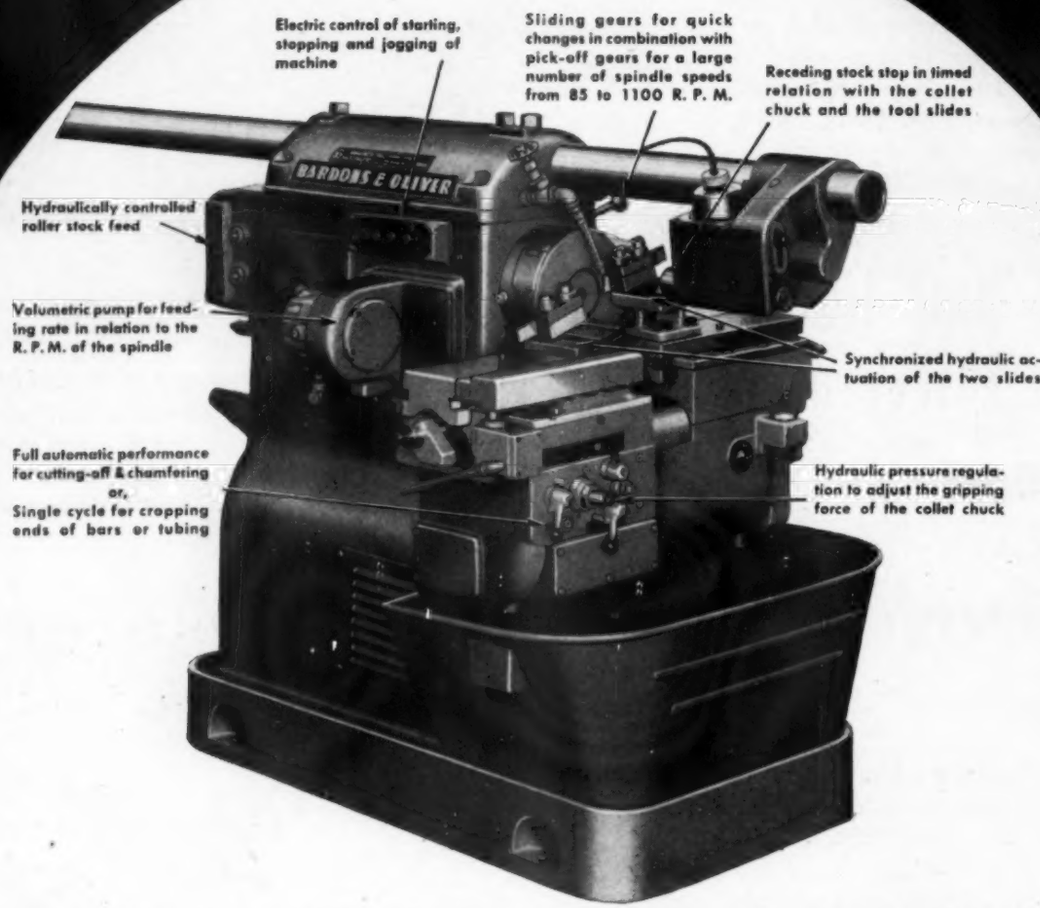
Introducing... The Bardons & Oliver HYDRALECTRIC AUTOMATIC CUTTING-OFF MACHINE


Electric control of starting, stopping and jogging of machine
Sliding gears for quick changes in combination with pick-off gears for a large number of spindle speeds from 85 to 1100 R. P. M.
Receding stock stop in timed relation with the collet chuck and the tool slides
Hydraulically controlled roller stock feed
Volumetric pump for feeding rate in relation to the R. P. M. of the spindle
Synchronized hydraulic actuation of the two slides
Full automatic performance for cutting-off & chamfering
or,
Single cycle for cropping ends of bars or tubing
Hydraulic pressure regulation to adjust the gripping force of the collet chuck
BARDONS & OLIVER

The rapid automatic performance of the hydralectric cutting-off machine, up to 30 cycles per minute, opens up new possibilities of fast production and low cost. One or more parts can be produced per cycle from tubing or pipe.

No. 33 has a capacity of 3", the No. 34 of 4" and the No. 35 of 5½" through the collet chuck.

Parallel sizes of manually operated hydralectric cutting-off machines are adapted for low cost production in smaller lots and greater variety of work.

Other sizes of cutting-off machines makes the Bardons & Oliver complete line able to handle pipe and tubing ranging from ¼" to 14½".

Write for full information.

We also build a complete line of Ram and Saddle Type Turret Lathes

BARDONS & OLIVER, INC.

1133 WEST 9TH STREET • CLEVELAND 13, OHIO

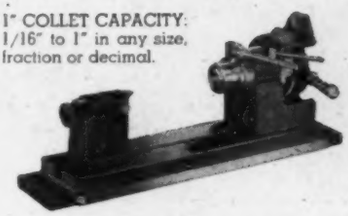
HARDINGE HORIZONTAL - VERTICAL

Collet Index Fixtures with Threaded Nose Spindle are fast in operation and hold work accurately

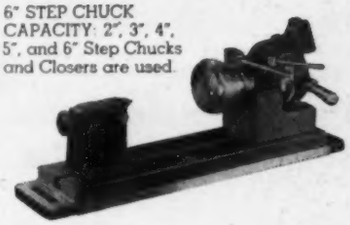
In addition to taking standard collets, this fixture takes step chucks and jaw chucks to cover a wide range of applications. It will eliminate the necessity of your tool room making many specially designed fixtures. Thus, your engineers and tool-makers will have more time for other work.

A preselector arrangement provides the selection of separate indexing of any number divisible into 20 or 24. The collet closer lever has a 100 to 1 leverage for quick opening and closing of collets and step chucks. Write for bulletin.

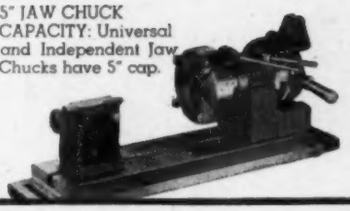
1" COLLET CAPACITY: 1/16" to 1" in any size, fraction or decimal.



6" STEP CHUCK CAPACITY: 2", 3", 4", 5", and 6" Step Chucks and Closers are used.



5" JAW CHUCK CAPACITY: Universal and Independent Jaw Chucks have 5" cap.



HARDINGE
ELMIRA, N.Y.

HARDINGE-SJOGREN SPEED COLLET CHUCKS

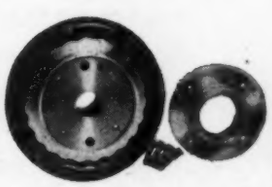
increase production of your lathes and milling machines

A Hardinge-Sjogren Nose Type Speed Collet Chuck enables you to get full value from your toolroom lathes, engine lathes and milling machines. It gives greater capacity, saves time, increases accuracy and assures better results. An almost effortless turn of the handwheel, one way or the other, automatically opens or closes the collet, releasing or gripping the work as desired. Its grip is adjustable and sure. Production is increased as the operator is always in front of his work. Available in these sizes . . . 1", 1⅜", 1¾", 2¼", or 3½" collet capacity. Write for bulletin.

For CAM-LOCK SPINDLES

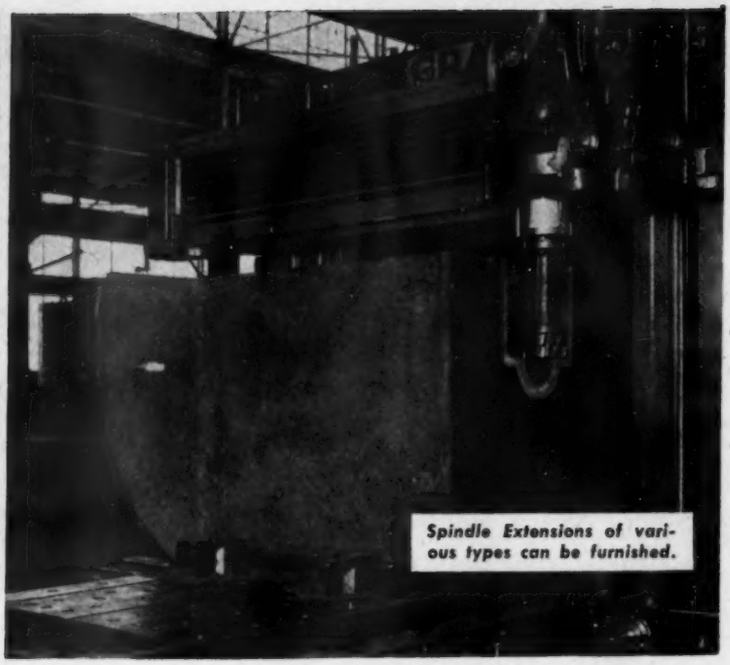
For TAPERED KEY DRIVE SPINDLES

For THREADED NOSE SPINDLES

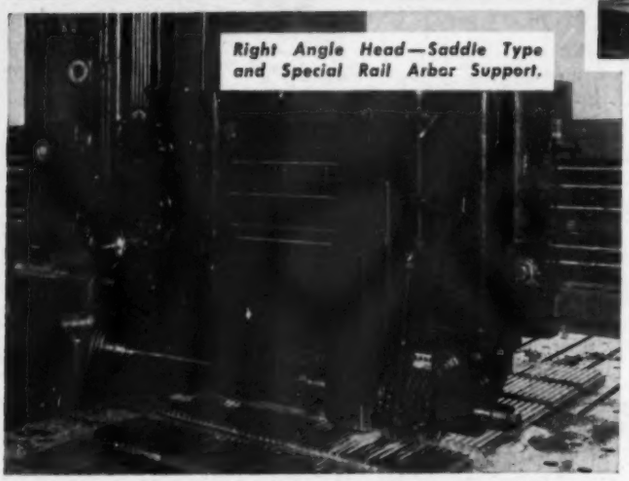


HARDINGE BROTHERS, INC., ELMIRA, N. Y.

Side head fastened to rail and fed up and down as a unit. Note Arbor support mounted on rail.



Spindle Extensions of various types can be furnished.



Right Angle Head—Saddle Type and Special Rail Arbor Support.

Right Angle Head — Special Bore-Milling Type.

The

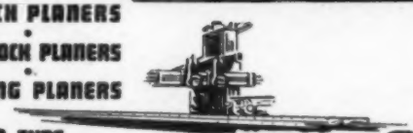
GRAY
UNIT HEAD MILLING MACHINE

can be equipped with supplemental equipment and special attachments that add greatly to the range and variety of work that can be handled to the best possible advantage.

Write for fully illustrated descriptive Bulletin No. 51.

DOUBLE HOUSING and OPENSIDE PLANERS
•
SWITCH PLANERS
•
DIE BLOCK PLANERS
•
MILLING PLANERS

PLANER TYPE MILLING MACHINES
•
HORIZONTAL BORING MACHINES



The G.A. **GRAY Co.**

CINCINNATI 7, OHIO, U.S.A.

SOLD IN CANADA BY UPTON, BRADEEN AND JAMES, LTD. • SOLD IN LATIN AMERICA BY MACHINE AFFILIATES

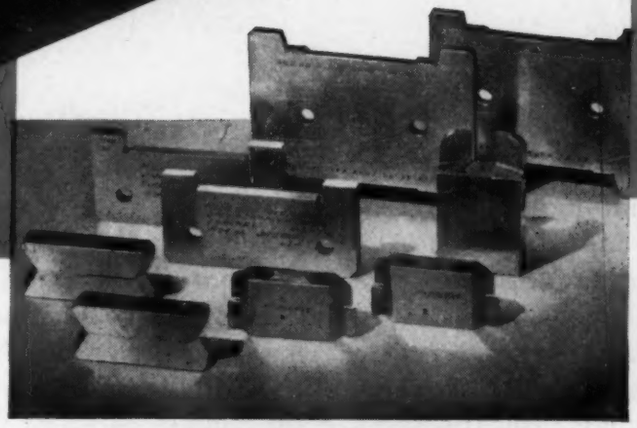
Get SMOOTH SURFACES for Accurate Layout Work

...USE

SIMONDS

"RED STREAK" Precision-Finished

FLAT GROUND STOCK



MAKE YOUR OWN GAUGES, dies, jigs, templates, stamps, shims, machine parts and small tools . . . with Simonds Oil Hardening Flat Stock, made of Simonds own alloy tool steel, uniformly annealed for easy machining and proper hardening.

SAVE TIME AND MONEY with this Flat Stock which is cut to 18" length and accurately ground to standard thicknesses and widths. *No need for the expensive machining required to grind ordinary stock to size.*

145 STOCK SIZES . . . special sizes to order. Get "Red Streak" Flat Ground Stock from your Simonds distributor, or the nearest Simonds office. Immediate delivery from stock.

SIMONDS SAW AND STEEL CO.

FITCHBURG, MASS.

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SIMONDS STEEL MILLS — SIMONDS SAW AND STEEL CO. LOCKPORT, N. Y. — *Special Electric Furnace Steels*

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SIMONDS CANADA SAW CO. LTD. MONTREAL TORONTO VANCOUVER SAINT JOHN, N.B. — *Simonds Products for Canada*

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EVERY DEMAND FOR SAVINGS IS BEING MET . . .

. . . in "The Tools You Buy Again"

Small tools — at the business ends of machines working to capacity — must be capable of making time, labor and material savings in order that production demands be met. UNION TOOLS are meeting such demands in the countless plants turning out war materiel. They are saving time by faster cutting — saving labor by requiring less resharpening — conserving material by assuring accuracy and minimizing spoilage.

The ability of UNION TOOLS to make savings is traceable to an in-built fineness of quality which in turn is the result of UNION'S long, specialized experience in small tool development.

For the sake of savings, it will pay you to standardize on UNION.

Twist Drills — Milling Cutters — Reamers — Hobs — Slitting Saws — End Mills — Taps — Dies — Screw Plates — Profile Cutters.

•

UNION
TWIST DRILL COMPANY
Athol, Mass.

STORES New York Store: 61 Reade St.; Los Angeles Store: 524 East Fourth St.; Chicago Store: 11 So. Clinton St.; Seattle Store: 568 First Ave., So.; San Francisco Store: 121 Second St.; Detroit Store: 5527 Woodward Ave.

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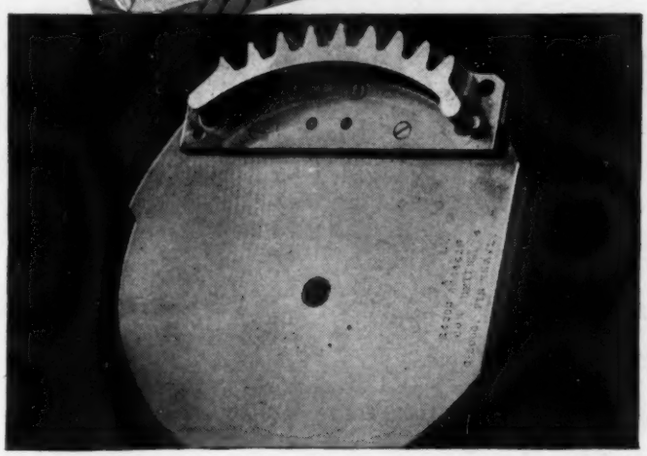
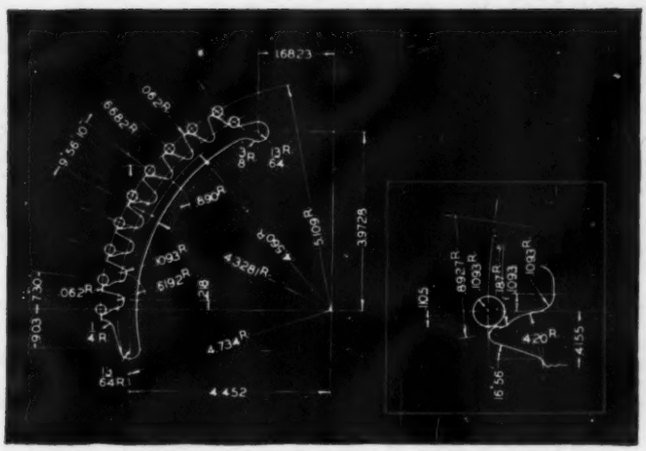
S. W. Card Mfg. Co., Div.; Mansfield, Mass.
Butterfield Division, Derby Line, Vt., and Rock Island, Quebec

UNION

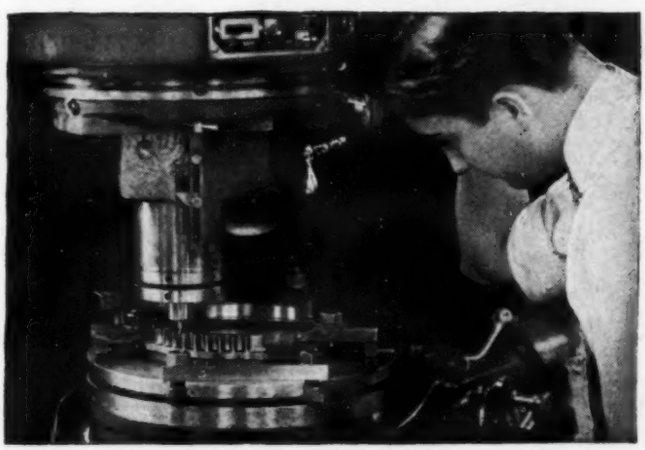
How to Mill this Shave Punch Complete in 60 Hours





1 **FAST!** 6 hours for layout and setup. 25 hours rough cut. 29 hours finish cut. Material: High carbon, high chrome steel. Total: 60 hours blank stock to finished shave punch. That's typical 2D Rotary Head Milling Machine performance.

2 **DIRECT!** Intricate shapes of punch teeth milled direct in workpiece. No fussing with models or templets. Blueprint was the only guide the operator had or needed. Precision control of all combinations of cutting movements did the rest.



3 **ACCURATE!** Single setup held chance of error to minimum. Operator relied on built-in precision, control and measuring devices — had no difficulty holding tolerance to +.0005"−.0000".

Photos and information Courtesy of National Cash Register Co.

4 For the Whole Story of how you can get the benefits of *Fast, Direct, Accurate* results on tough intricate jobs using the Model 2D Rotary Head Milling Machine—send for bulletin 1002C.

KEARNEY & TRECKER CORPORATION
MILWAUKEE 14, WISCONSIN

The CONE AUTOMATIC MACHINE COMPANY sees many GOOD THINGS AHEAD

It is reported that . . . . . .

Goodyear Tire & Rubber Co. are making a 30-foot rubber electric heating pad to dry the inks used in printing textile fabrics.

get ready with CONE for tomorrow

Farnsworth Television & Radio Corporation has the "Utiliscope", a television set that shows, in any room, a continuous picture of operations in a remote, inaccessible or dangerous part of a plant.

be ready with CONE for today

The Moore School of Engineering of U of P is building an electronic computor. It is reported that this new machine is faster than the famous ENIAC, will remember fifty times as many numbers and uses only 3,000 tubes, instead of 18,000.

get ready with CONE for tomorrow

The new Blaw-Knox equipment pulverizes coal by self-abrasion in a blast of super-heated steam.

be ready with CONE for today

The Marmon-Herrington 44-passenger trolley bus uses light metals to reduce weight to 17,230 pounds.

get ready with CONE for tomorrow

General Electric Company has two steam turbine generators under construction for electric power companies. These will use steam at 2,000 pounds pressure and 1,050 degrees and develop 125,000 kilowatts.

be ready with CONE for today

Western Pine Association hopes to cut lumber drying time to 4 hours by the use of acetone spray.

get ready with CONE for tomorrow

Flaw-free 90° creases can now be formed in thermoplastic sheet of .005" to .020" thickness up to 30" wide on a repetitively uniform, high-speed production basis with a newly designed machine incorporating thermostatically controlled "instant-crease" action developed by the Sheet Plastics Equipment Division of Taber Instrument Corporation.

Dow Latex 512 is offered as an immediately available substitute for linseed and other vegetable oils.

get ready with CONE for tomorrow

In a new method of bridge building, developed at the University of Illinois, the concrete roadway is rigidly connected to the steel structure. This "composite construction" is said to save 30% in the weight of steel beams used.

be ready with CONE for today

Shell Chemical Co. has plans for the commercial production of glycerin from petroleum in 1948.

get ready with CONE for tomorrow

National Carbon Co. claims that its new flashlight cell has double the capacity of previous cells due to improved chemical mixture.

Commonwealth Edison Co. has a "cyclone" burner in its Calumet Station that removes 80% of the coal ash as molten slag in the burner.

be ready with CONE for today

Improvements and innovations in multiple spindle automatic bar machine design will be represented by the new models on display at the Cone Automatic Machine Co. booth at the Chicago Machine Tool Show.

get ready with CONE for tomorrow

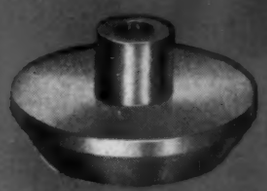
Link-Belt Company's Electro-fluid Drive is a combination of electric motor and the familiar "fluid flywheel". It reduces the starting load, cushions shocks and prevents damage from overload.

be ready with CONE for today

Experimental work on a process for forming cold bonderized sheet steel under pressures as high as 230,000 psi is being conducted by Heintz Manufacturing Co. of Philadelphia. If successful, the process may greatly reduce the cost of many common steel articles.

FOLLOW THESE PAGES FOR NEWS OF PROGRESSIVE PRODUCTION

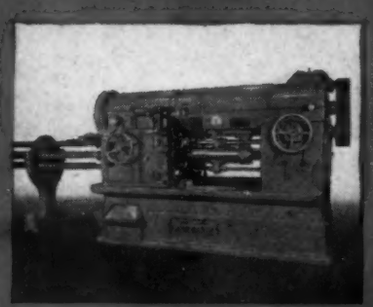
Put the *usual* jobs on any automatic.



Put the *particular* jobs on a CONE.

From 1⅞" dia. SAE 1112 a 6-Spindle Conomatic produces the part shown in 44 seconds.

See the CONE *booth at the Machine Tool Show.*



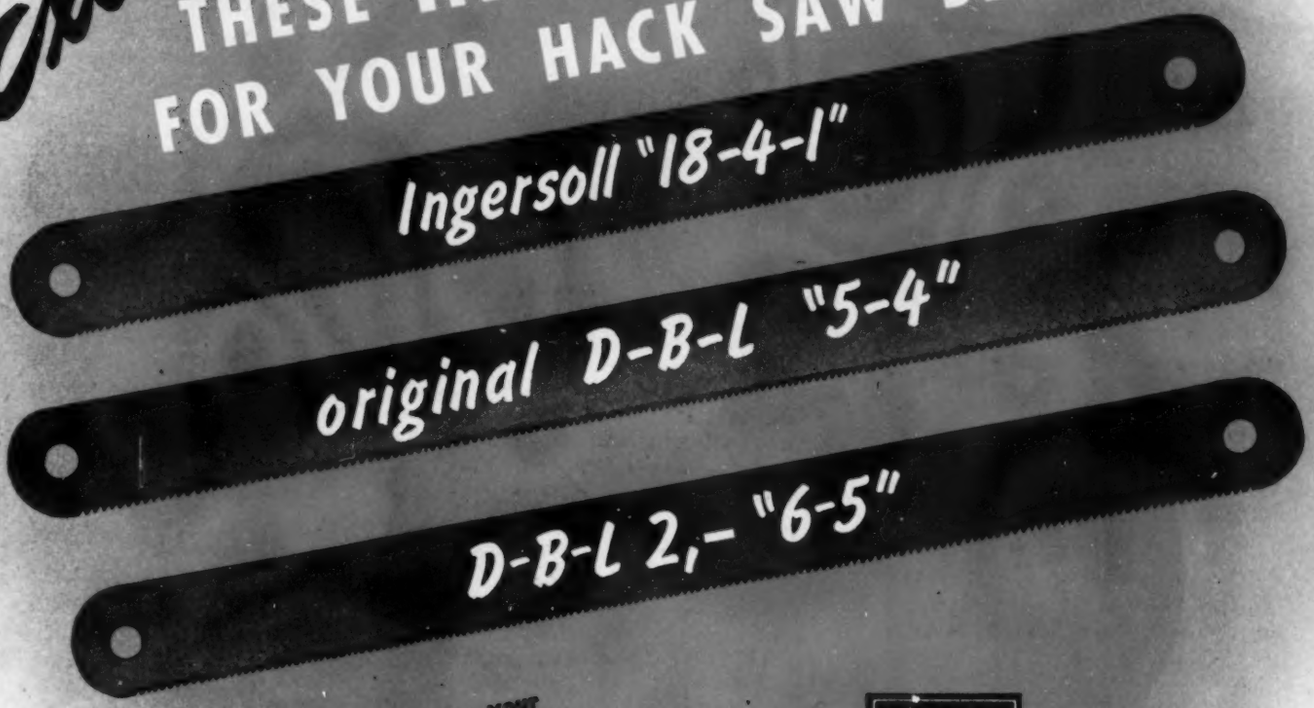
CONE

AUTOMATIC MACHINE CO., INC. ★ WINDSOR, VERMONT, U.S.A.

41

Extra TOUGH— Extra DURABLE!

THESE INGERSOLL STEELS FOR YOUR HACK SAW BLADES



Next time you order hack saw blades from your regular supplier, specify blades made of Ingersoll 18-4-1 or Ingersoll D-B-L Steel. That way you're sure of getting blades that can take plenty of punishment . . . blades that offer complete hack saw satisfaction, because Ingersoll steels insure—

1. Tougher Cutting Edges
2. Higher Impact Resistance
3. Relative Freedom from Decarburization

No wonder blades made of Ingersoll Hack Saw Steels have such an outstanding record of on-the-job performance and are considered "master tools" by master mechanics all over America.

ENGINEERING B-W PRODUCTION

INGERSOLL Steel Division

Borg-Warner Corporation • New Castle, Indiana

Plants: New Castle, Indiana • Chicago, Illinois • Kalamazoo, Michigan

*Furnished in the original D-B-L Regular, -"5-4" and D-B-L 2, -"6-5".

INGERSOLL "18-4-1" INGERSOLL D-B-L* Hack Saw Steels

INGERSOLL *Special* STEELS FOR *Special* USES

...oy Steels
...nor Plate
...ch Plate Steels
...ge Steels

Soft Center Steels
Shovel Steels
Knife Steels
TEM-CROSS Steel

IngAclad (Stainless-Clad Steel)
Stainless Steels and Saw Steels, including "18-4-1" and Molybdenum and D-B-L Hack Saw Steels.

1

The Cylindrical Roller Bearing

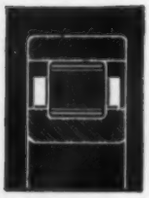
AS PRODUCED BY NORMA-HOFFMANN

USE THIS BEARING WHERE NO OTHER ANTI-FRICTION BEARING WILL STAND UP:

- HIGH SPEEDS
- PLUS HEAVY LOADS
- PLUS TEMPORARY OVERLOADS
- PLUS SHOCK
- PLUS VIBRATION

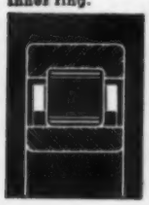
NORMA-HOFFMANN PRECISION ROLLER BEARINGS GUARANTEE YOU:

- LARGER SHOCK-ABSORBING CAPACITY THAN ANY OTHER TYPE SINGLE-ROW BEARINGS.
- MARGIN FOR 50% OVERLOADS.
- LOWER FRICTION COEFFICIENT UNDER HEAVY LOAD THAN ANY OTHER TYPE BEARING.
- SPEEDABILITY EQUAL TO ANY BALL BEARING, SIZE FOR SIZE, UP TO 35,000 R.P.M.
- 100% MACHINED, EXTRUDED BRONZE CAGE OF MAXIMUM DENSITY AND UNIFORMITY.

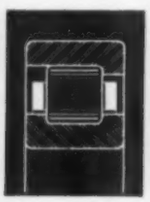


"R" Type: For heavy radial load and axial float. Straight outer ring, two-lipped inner ring.

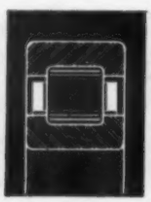
FIVE STANDARD TYPES of cylindrical roller bearings are shown in cross-section below. Other variations of this type are also available. Metric and inch sizes up to 22½" bore.



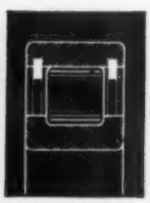
"R-E" Type: For heavy radial load and axial float. Two-lipped outer ring, straight inner ring.



"R-L" Type: For heavy radial load and one-direction axial location. One-lipped outer ring, two-lipped inner ring.



"R-LL" Type: For heavy radial load and two-direction axial location. Two-lipped outer ring, two-lipped inner ring.



"R-RR" Type: For heavy radial load. Full-roller retainerless type with snap rings.

"NORMA-HOFFMANN"

PRECISION BALL, ROLLER AND THRUST BEARINGS

NORMA-HOFFMANN BEARINGS CORPORATION
STAMFORD, CONNECTICUT
FIELD OFFICES: New York, Chicago, Cleveland, Detroit, Pittsburgh, Cincinnati, Los Angeles, San Francisco, Portland, Ore., Seattle, Phoenix

A High Return on INVESTMENT

Courtesy of
R. K. Le Blond Machine
Tool Company

MACHINE TOOL SHOW
Chicago, Sept. 17-26
Booth No. 414

These sturdy machines with many automatic features, combined with simplified controls, concentrated on the head—save waste movement of the operator and much physical effort.

One constant speed motor drives the spindle and raises and lowers the arm—a simple, direct maintenance free drive.

Within their range, these highly productive, 9" column, 3 or 4-foot arm High-Speed All-Geared Super Service Radials give a high return on investment.

Write for detailed Bulletin R-21-B.

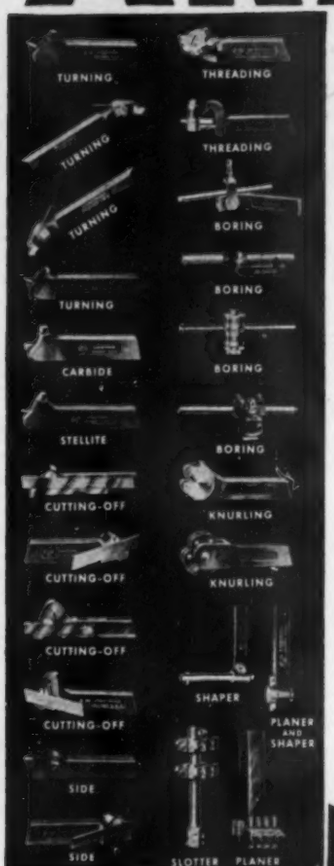
See our condensed catalog in Sweet's File.

RADIAL AND UPRIGHT SUPER C.B SERVICE DRILLING MACHINES

Equal Efficiency of Every Unit *Makes the Balanced Machine*

THE CINCINNATI BICKFORD TOOL CO. Cincinnati 9, Ohio U.S.A.

ARMSTRONG



ARMSTRONG TOOL HOLDERS
give the lowest possible tool cost

The more operations you tool with ARMSTRONG TOOL HOLDERS, the greater your savings and profits. These permanent multi-purpose tools are low in initial cost. They give years of continuous service, reducing the direct tool cost per job to a matter of cents. Using small cutters or bits quickly ground from stock shapes they "Save: All Forging, 70% Grinding and 90% High Speed."

But greater still than these substantial direct savings are the indirect savings these tools effect. They reduce "tooling-up" to a matter of minutes—end costly delays and keep men and machines producing. Strong and efficient, they permit higher speeds and heavy feeds—machine more pieces per machine hour, machine more accurately, reducing losses through rejects or spoilage.

Use ARMSTRONG TOOL HOLDERS for every operation on lathes, planers, slotters and shapers, on turret lathes and screw machines, to cut costs and increase profits.

ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

315 N. Francisco Avenue **Chicago 12, U. S. A.**

Eastern Whse. & Sales: 199 Lafayette St., N. Y. 12, N. Y.

Pacific Coast Whse. & Sales Office: 1275 Mission St., San Francisco 3

Write for Bulletins on—

(a) ARMSTRONG Carbide Tool Holders and ARMIDE Carbide Cutters

(b) ARMSTRONG CA Tool Holders and ARMALOY Cast Alloy Cutters

1. Spray Gun Body, forged for The DeVilbiss Company
2. Spirit Level Frame, forged for Hall Level & Mfg. Co.
3. Notary Seal Frame, forged for R. H. Smith Mfg. Co.
4. Trowel Mounting, forged for Marshalltown Trowel Co.
5. Hacksaw Frame, forged for Armstrong-Blum Co.
6. Shotgun Shell Receiver and Trigger Guard, forged for Savage Arms Corporation.

Try the heft of a spirit level or a hacksaw frame or a notary seal that's made of an Alcoa Aluminum Forging. Light, isn't it? Strong, too, to take the blows and impact of everyday hard use. That's the kind of hand tools that workmen go for . . . light to carry, strong to last.

Whatever you are making— hand tools or machine parts, household or heavy-duty equipment—you should know more about Alcoa Aluminum Forgings. They have strengths up to 82,000 psi. ultimate, elongations as high as 15%, and cost less than you'd think.

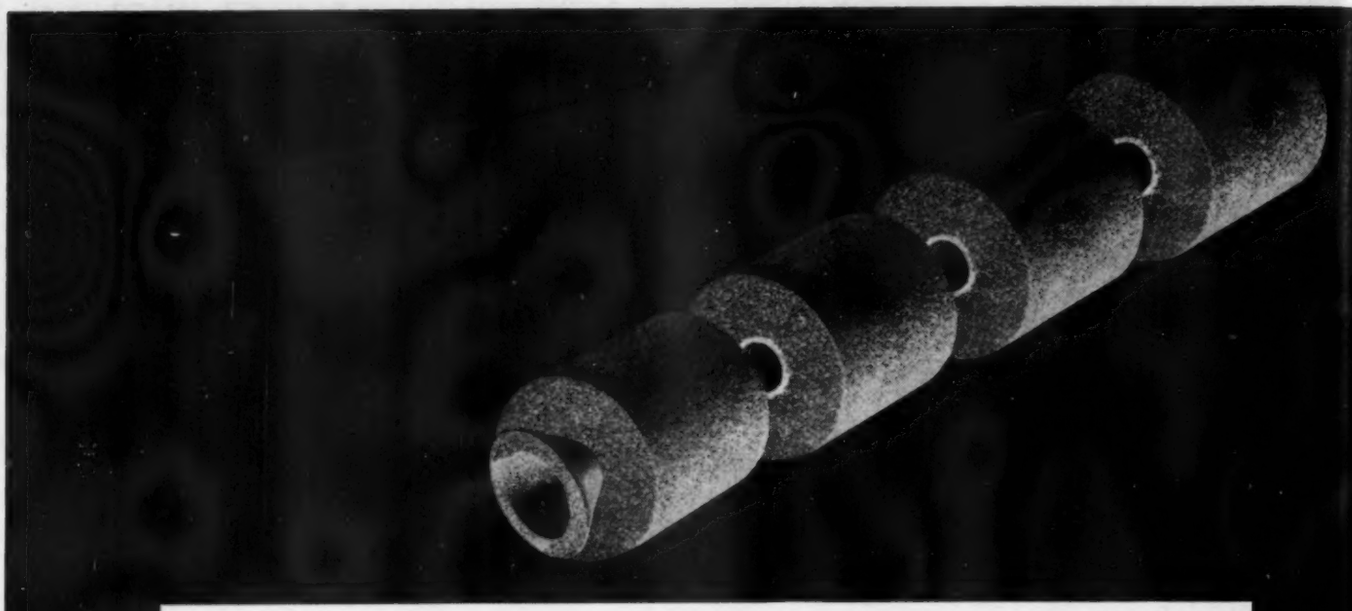
We'll be happy to help you with the economics and the design of parts as Alcoa Aluminum Forgings. ALUMINUM COMPANY OF AMERICA, 2107 Gulf Bldg., Pittsburgh 19, Pa. Sales offices in leading cities.

MORE people want MORE aluminum for MORE uses than ever

ALCOA FIRST IN **ALUMINUM**

ALCOA ALUMINUM

IN EVERY COMMERCIAL FORM



Here's new light on lower grinding costs

Old-fashioned methods of figuring grinding costs can easily keep you in the dark.

Worse yet, they give false information that wastes dollars every day.

If you want to see the light on your grinding costs, here's a simple way that has already saved a lot of money for men in your own industry.

We're talking about the Peninsular method of calculating true expenses by careful analysis of all factors that influence grinding costs.

Peninsular engineers, who do the job, have specialized in grinding problems since 1889. And in almost every case they've worked on, *they have been able to cut production expenses appreciably.*

The Peninsular Grinding Wheel Co., 729 Meldrum Ave., Detroit 7, Michigan. *Sales Offices:* Chicago, Philadelphia, Boston, Buffalo, Cleveland, Pittsburgh, Houston, St. Louis, Cincinnati.

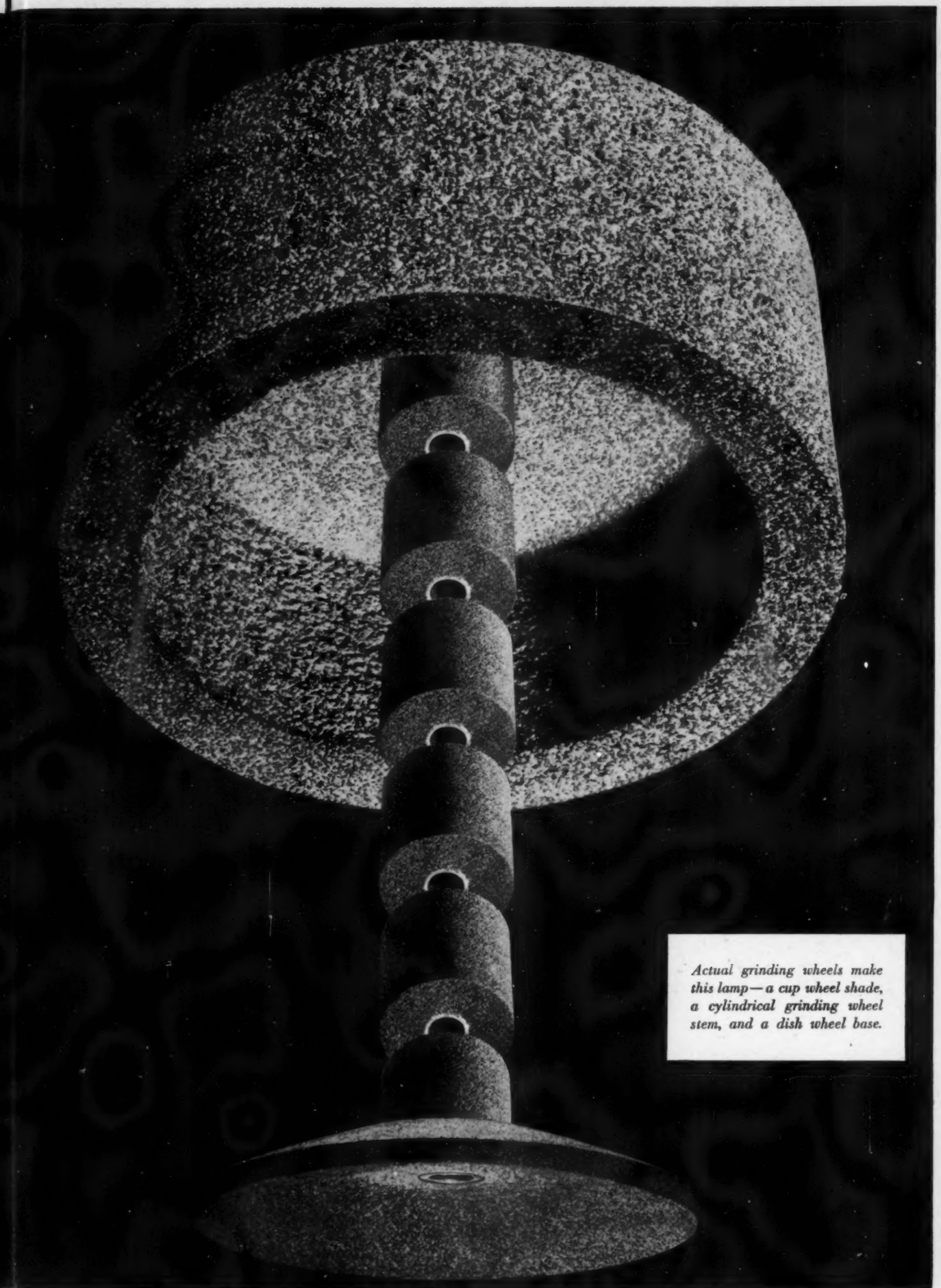
PENINSULAR

INDIVIDUALLY PENINSULAR ENGINEERED

GRINDING WHEELS

SINCE 1889

SPECIALISTS IN RESINOID BONDED WHEELS



Actual grinding wheels make this lamp—a cup wheel shade, a cylindrical grinding wheel stem, and a dish wheel base.

A PROFIT MAKER for these men

Built with care, of fine materials, in a wide range of sizes.

CINCINNATI Lathes, with their simple construction and ease of operation, offer capacity for practically all of your lathe work with a minimum of investment.

Six nominal swings: 14″ to 24″ Bed lengths providing distances between centers from 32″ to 238″ (19′ 10″).

12 Spindle Speeds—32 changes of threads and feeds.

Write for our circulars and prices

7 Lathes IN OPERATION

THESE LATHES "of outstanding value"

and some remarkable new developments, never before exhibited, will be on display at

BOOTH 522 Machine Tool Show SEPT. 17-26

CINCINNATI LATHE & TOOL CO.

CABLE ADDRESS: CINTILATHE

OAKLEY, CINCINNATI 9, OHIO

New rigidity and power for today's cutting materials

NEWTON 8 SPINDLE TWO-STATION UNIT HEAD ROTARY MILLING MACHINE

Designed for high production milling of Automotive Cylinder Blocks and heads, transmission cases, and similar parts, this machine is equipped with two sets of roughing and two sets of finishing spindles with operating stations on each side of the machine, making possible twice the productive capacity of the conventional single station machine.

WILLIAM SELLERS & COMPANY MACHINE TOOLS
are now built by the
WILLIAM SELLERS DIVISION,
CONSOLIDATED MACHINE TOOL CORPORATION

BUILDERS OF HEAVY DUTY MACHINE TOOLS SINCE 1861

…ong Heavy Machine Tools built by Consolidated are . . . .

LATHES
BORING MILLS
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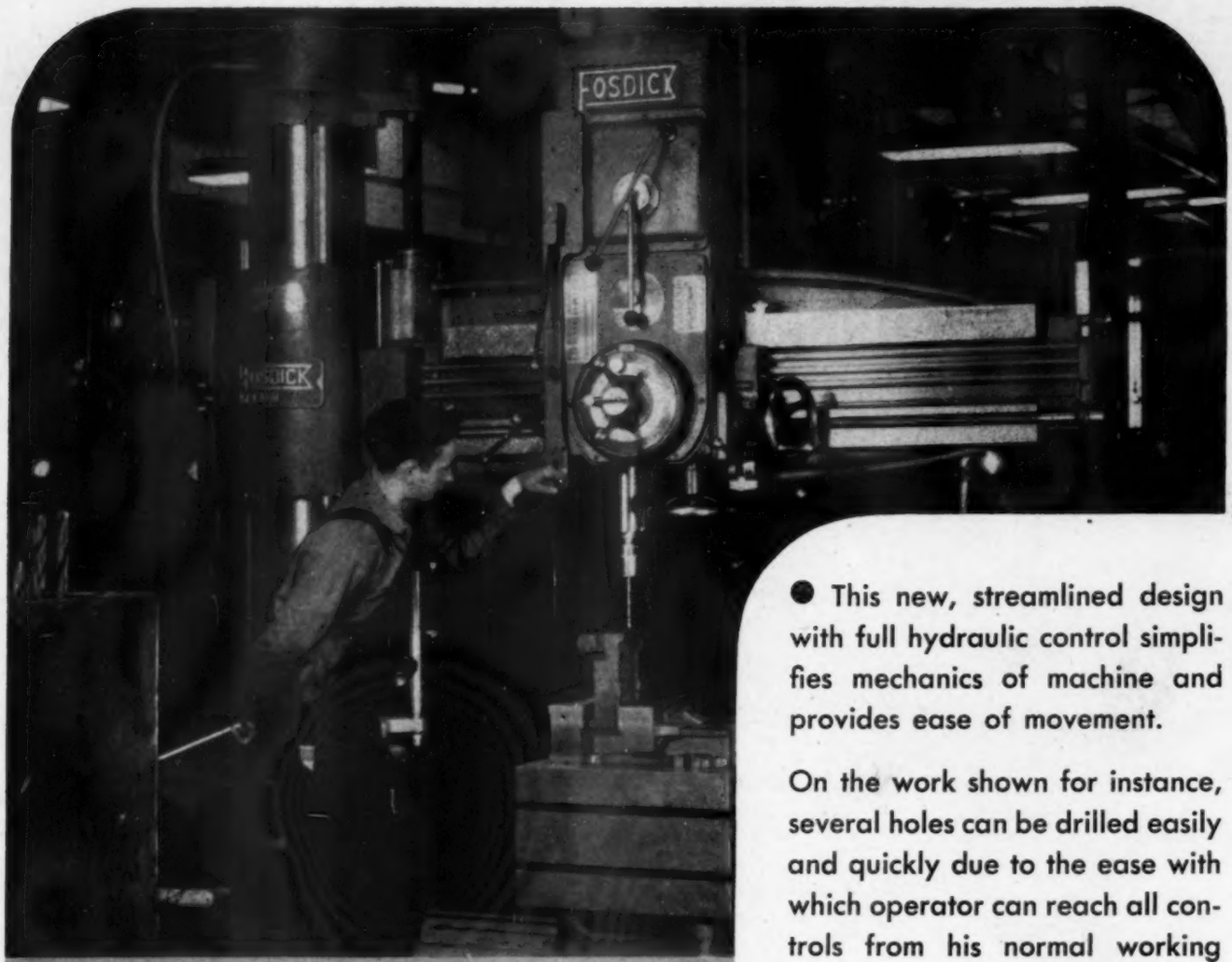
CONSOLIDATED MACHINE TOOL CORPORATION

ROCHESTER 10, NEW YORK



Hydraulic Control speeds production ... cuts costs on

FOSDICK RADIAL

● This new, streamlined design with full hydraulic control simplifies mechanics of machine and provides ease of movement.

On the work shown for instance, several holes can be drilled easily and quickly due to the ease with which operator can reach all controls from his normal working position. Variable rapid traverse to the head aids in locating the drill with least amount of effort.

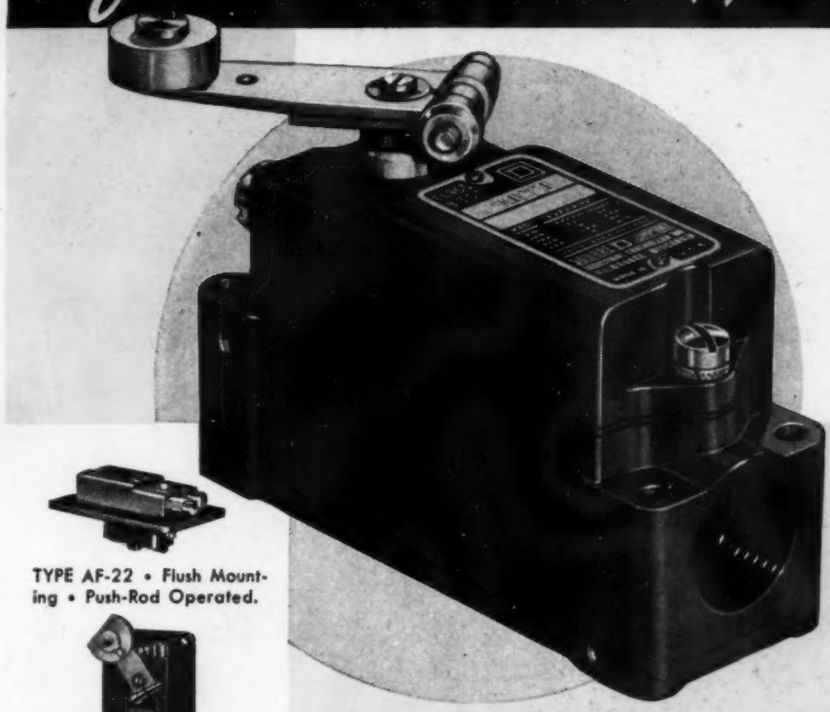
These savings in operating time add up to greater production at lower costs. Why not put your next Radial job on a Fosdick Hydraulic and see for yourself the many time and cost saving advantages this modern machine provides.

For full mechanical details write for Fosdick Radial Drill bulletin R.A.

THE *Fosdick* MACHINE TOOL COMPANY
CINCINNATI 23, OHIO

Square D's *Precision Snap Switch* in oil-tight limit switch enclosures *for Machine Tool Applications*

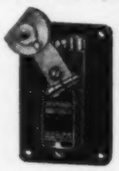
PART OF THE PARADE OF NEW DESIGNS



At left—Surface mounted, lever operated Class 9007, Type AW-12 limit switch.

Above—Cover of limit switch removed to show mounting of precision snap switch and four terminal posts.

TYPE AF-22 • Flush Mounting • Push-Rod Operated.



TYPE AF-12 • Flush Mounting • Lever Operated.

TYPE AW-22 • Surface Mounting • Push-Rod Operated.

OPERATING ARMS • Available with ⅜" to ¼" Standard Roller or Special Rollers.

The New Limit Switch is a "natural" for machine tool applications. Completely oil-tight, gasketed, die-cast enclosure • Mechanism requires only 5° travel to trip and provides 25° overtravel • Operating arms adjustable to any position around a circle and available in five lengths • One-way and other special rollers available • Return springs easily reversed for either clockwise or counter-clockwise lever operation or removed for maintained contact action • Surface and flush mounting arrangements with either roller arm or push rod operated mechanisms meet virtually any mounting and application requirement • Box of surface mounted arrangement can be rotated to provide conduit entrance at either end of switch.

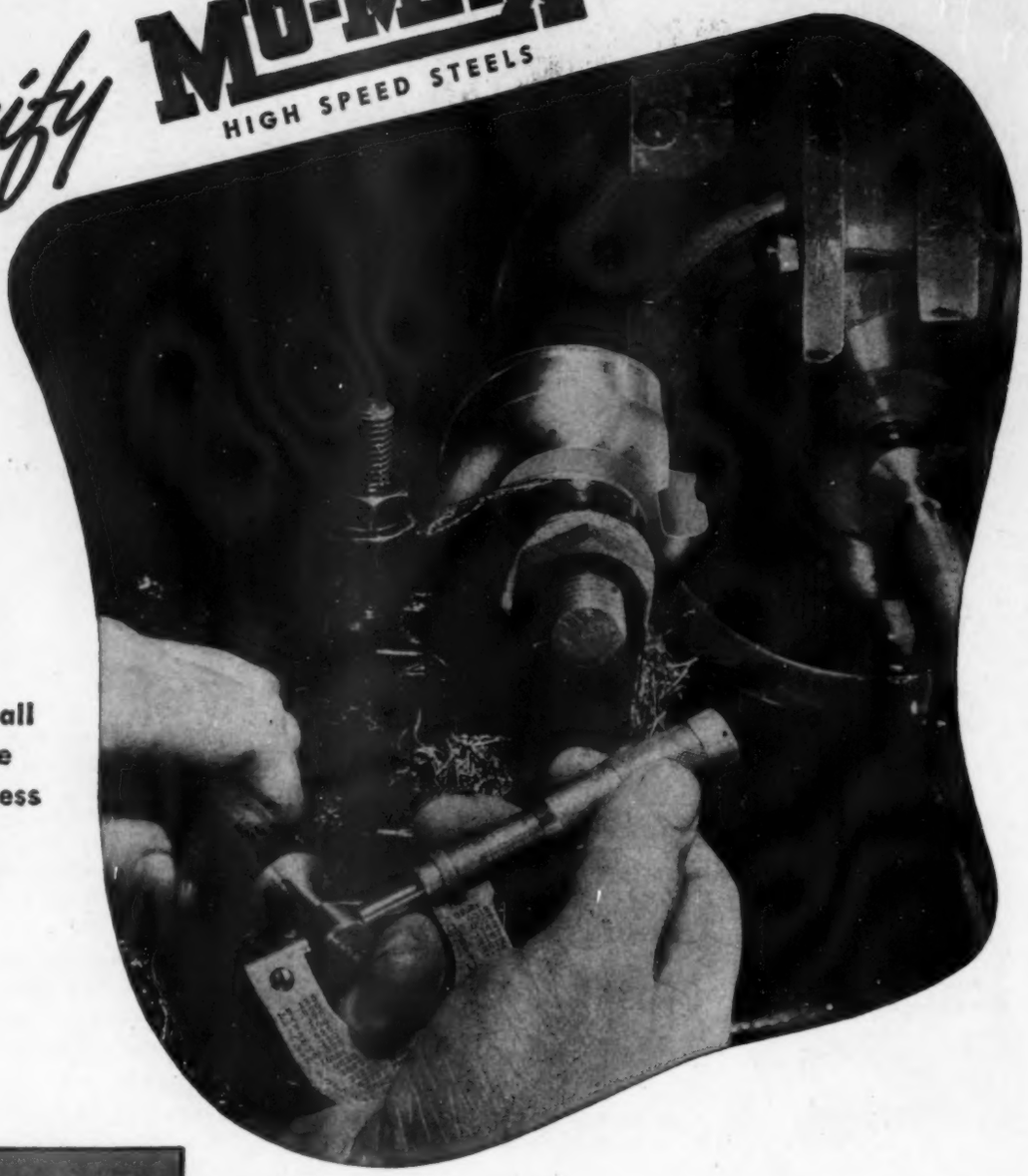
The Precision Snap Switch operating mechanism consisting of only two alloy leaf springs has no dead center position and gives exceptionally long life • Stainless steel compression return spring insures positive operation and reliable service • Husky highly arc resistant melamine case • Heavy contact blade separate from operating mechanism • Terminals, suitable for No. 14 wire • Separate normally open and normally closed circuits have double break silver contacts.

Write Square D Company, 4041 N. Richards St., Milwaukee 12, Wisconsin.
Or ask your nearby Square D Field Engineer to show you a sample.

SQUARE D COMPANY

DETROIT • MILWAUKEE • LOS ANGELES

Specify MO-MAX HIGH SPEED STEELS



In circular and flat forming tools, as in all other cutting tools, the toughness and hardness of MO-MAX assure better performance.

Buyer's Guide to Brands of MO-MAX

"LMW"	Allegheny Ludlum Steel Corporation
"MOHICAN"	Atlas Steels Limited
"BETHLEHEM HM"	Bethlehem Steel Company
"MO-CUT"	Braeburn Alloy Steel Corporation
"STAR MAX"	Carpenter Steel Company
"MOLITE M-1"	Columbia Tool Steel Company
"REX T-MO"	Crucible Steel Company of America
"DI-MOL"	Henry Disston & Sons, Inc.
"HI-MO"	Firth-Sterling Steel Company
"REX T-MO"	Halcomb Steel Company
"MOGUL"	Jessop Steel Company
"TATMO"	Latrobe Electric Steel Company
"MIDMAX"	The Midvale Company
"S. T. M."	Simonds Saw & Steel Company
"MO-TUNG"	Universal-Cyclops Steel Corporation
"V-N-2"	Vanadium-Alloys Steel Company
"VUL-MO"	Vulcan Crucible Steel Company

Only MO-MAX GIVES YOU *ALL* THESE ADVANTAGES

1. MO-MAX has superior cutting qualities.
2. The machinability of MO-MAX is unexcelled.
3. MO-MAX is economical. Its specific gravity is about 8% less than that of 18% tungsten steel.
4. MO-MAX is available in a standardized composition; also in cobalt and high vanadium varieties for special high speed steel requirements.
5. For 14 years MO-MAX has demonstrated its superiority in all types of cutting tools.

Learn all the facts! **Send for your copy of the MO-MAX Handbook, sixth edition. Get the full story about this remarkable steel, including easy-to-follow instructions on heat treating.**

THE CLEVELAND TWIST DRILL COMPANY

1244 East 49th Street • Cleveland 14, Ohio

Would You Go to a Tailor to Have Your Eyes Examined?

Your eyes are your most precious possession. Certainly, you wouldn't think of having them examined by a tailor. The very idea is absurd!

Well, it's just as absurd to buy your milling machine arbors from one who fails to understand arbor needs. Naturally, you would look for a specialist in that field.

Kempsmith has concentrated its efforts in building precision-built milling machines and equipment for more than a half-century. That's why Kempsmith engineers KNOW arbors and accessories . . . KNOW how to build them . . . KNOW how they can best serve your milling requirements.

Kempsmith Arbors, including a full line of standard accessories, are regularly carried in stock for immediate shipment. They are adaptable to ANY make of milling machine equipped with standardized spindle. Also special arbors made for any purpose. Write today for new Kempsmith Arbor Bulletin. The coupon below is for your convenience.

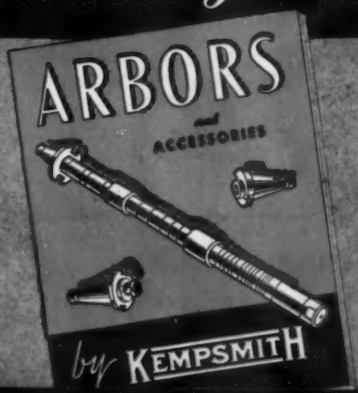
Buy Your Arbors from an Arbor Specialist

KEMPSMITH ARBORS

Precision Built Milling Machines Since 1888

Get Your Copy of this
NEW ARBOR BULLETIN

Describes the complete Kempsmith line of Arbors and Accessories. Also gives you helpful information on how to keep your arbors in condition. Fill in and mail coupon — today. No obligation.



THE KEMPSMITH MACHINE CO.
1821 South 71st Street, Milwaukee 14, Wis., U. S. A.

YES, I'm anxious to get the right type of arbor for my milling machine. Send me copy of your Arbor Bulletin No. 116.

Name_____

Title_____

Firm_____

Address_____

Metal Cutting

MARVEL SAWS

Better Machines–Better Blades

Regardless what type hack saw machines and metal-cutting band saw machines you use, MARVEL BLADES will improve performance. There are sound reasons why this is true; practical reasons that are easily understood and demonstrated.

MARVEL High-Speed-Edge Hack Saw Blades, with a genuine high-speed-steel cutting edge integrally welded to a tough alloy steel body, are both fast-cutting and *positively unbreakable*. This construction permits greatly increased speeds and feeds and tauter blade tensioning. Still, they last much longer than ordinary blades.

MARVEL High-Speed-Edge Hole Saws, with this same unbreakable construction and heavy-duty arbors, have the extra strength required for drill press and lathe use . . . rapidly saw holes from ⅝" to 4½" diameter thru steel of up to 1⅛" thickness.

MARVEL Band Saws are of selected quality. They come ready for use, pre-welded to size for each make and model saw. Individually boxed, they are protected against kinking, rusting or damage to teeth!

Write for Blade Catalog Sheet.

ARMSTRONG-BLUM MFG. CO.

5700 BLOOMINGDALE AVE. • CHICAGO 39, U. S. A.

REMOVE METAL *Fast*

with these Brown & Sharpe Side Mills

HALF SIDE MILLING CUTTERS
Used for side cuts, straddle milling or in cutting slots, where complete bottom finish isn't required. Spiral on top and undercut on side give teeth improved cutting action.

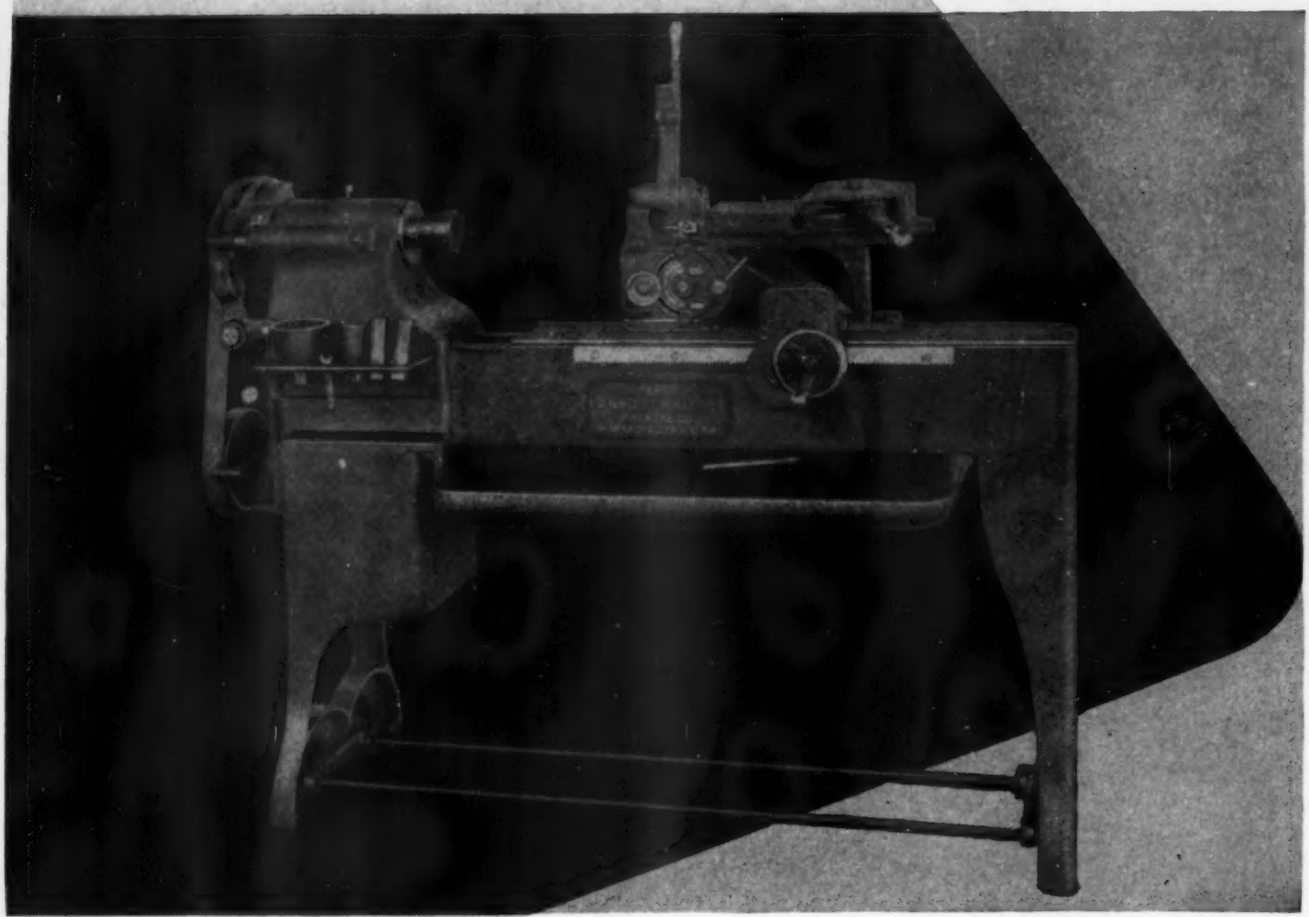
PUT any one of these Brown & Sharpe Side Milling Cutters to work on a piece of metal and that metal will take shape quickly and accurately. In actual operation, you'll benefit by the inherent qualities of Brown & Sharpe design and craftsmanship that set the pace for all types of cutters.

These side mills have clean-cutting qualities . . . ample chip space, carefully calculated rake angle, selected steels, scientific heat treatment individualized for each type of cutter, and expert sharpening. These are qualities that users have learned to expect in Brown & Sharpe Cutters. They're money-savers and production boosters because they combine to give unexcelled performance in speed, accuracy and more pieces per sharpening. Specify Brown & Sharpe when ordering cutters. Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.

We urge buying through the Distributor

BROWN & SHARPE CUTTERS B·S

CORRECT CENTERING...
is an IMPORTANT OPERATION

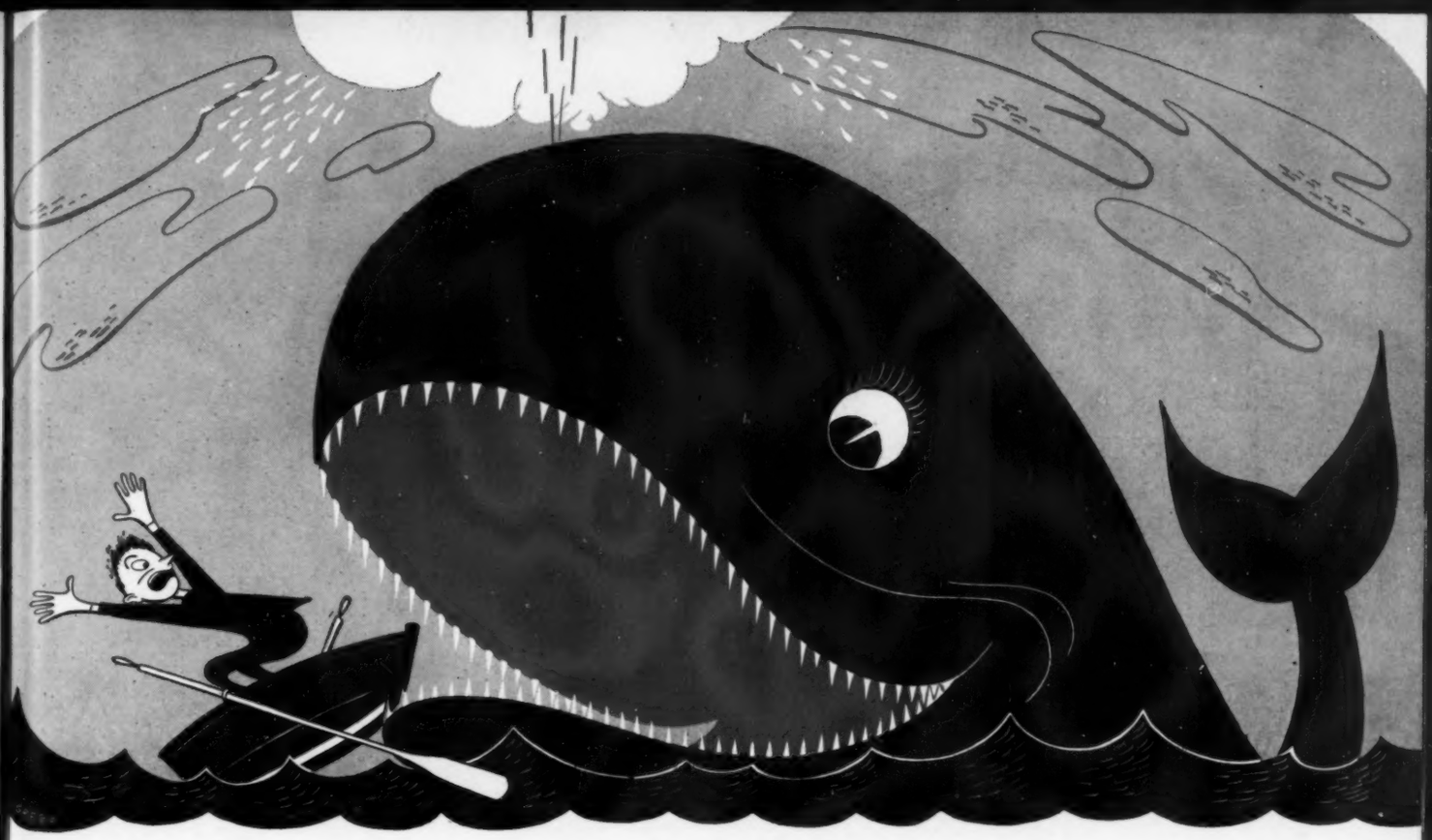


The Hanson-Whitney Rapid Precision Centering Machine has solved the problem of accurate, rapid centering of bright rolled stock, or parts produced on bar machines where centers are required for a succeeding operation. The correct principle of rotating work in center-rest is utilized. Center is drilled and shaved in separate operations. Center-rest is quick-acting roller type, instantly adjustable for diameter through observation dial. The unique, quick-acting work chucks, in conjunction with foot-treadle operation, enable varying diameters to be handled with the utmost speed and accuracy.

Write for descriptive folder today.

Hanson-Whitney

MACHINE COMPANY
HARTFORD • CONNECTICUT



Are you down-in-the-mouth about cutting oil problems?

. . . solve them through

Standard's CUTTING OIL SERVICE

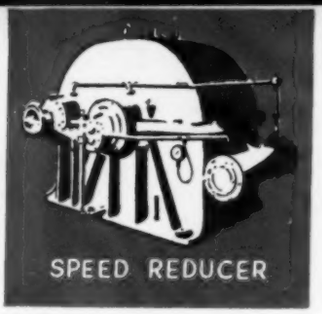
DO YOU FIND your time swallowed up in the details of determining which cutting oils or coolants to use . . . for instance, when tooling up for new products or parts? Those ever-recurring problems—how to get long tool life, good finish, and accuracy—do you have any difficulty solving them? When you see that you are headed for trouble on any cutting oil question, hail the nearest Standard Oil office and get the help of a Cutting Oil Specialist.

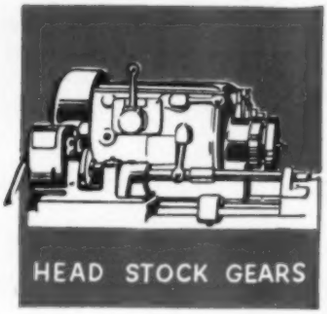
Standard's Cutting Oil Service is available to all operators in the Midwest. A Cutting Oil Specialist is easy to reach and ready to study your cutting oil needs. He'll analyze just one job or the operation of your whole plant, whichever you wish.

There are two good reasons why you can depend on his help. First, he has thorough knowledge of products developed by Standard Oil for practically all machining operations. Second, he has had experience in applying these products in many other plants. When the selection of the right cutting oils looks like a whale of a job, call in this Cutting Oil Specialist. Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Ill.

STANDARD OIL COMPANY (INDIANA) STANDARD SERVICE

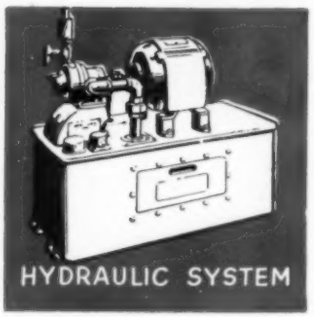
Count how many places in your





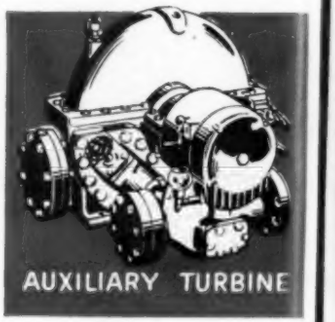
plant Stanoils can be used.

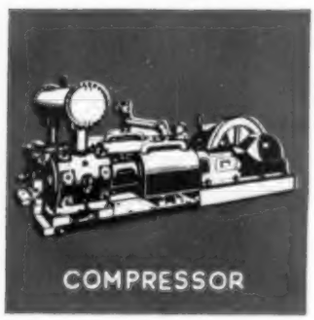
Find out how



Stanoils frequently

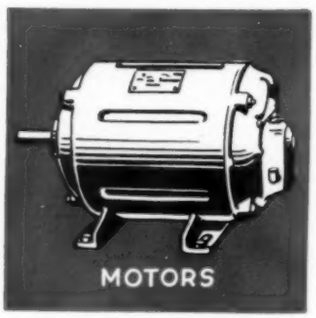
can replace costly special-purpose





oils...can give equally good or bette

lubrication, and, at the same



time,

reduce the number of oils you must stock.

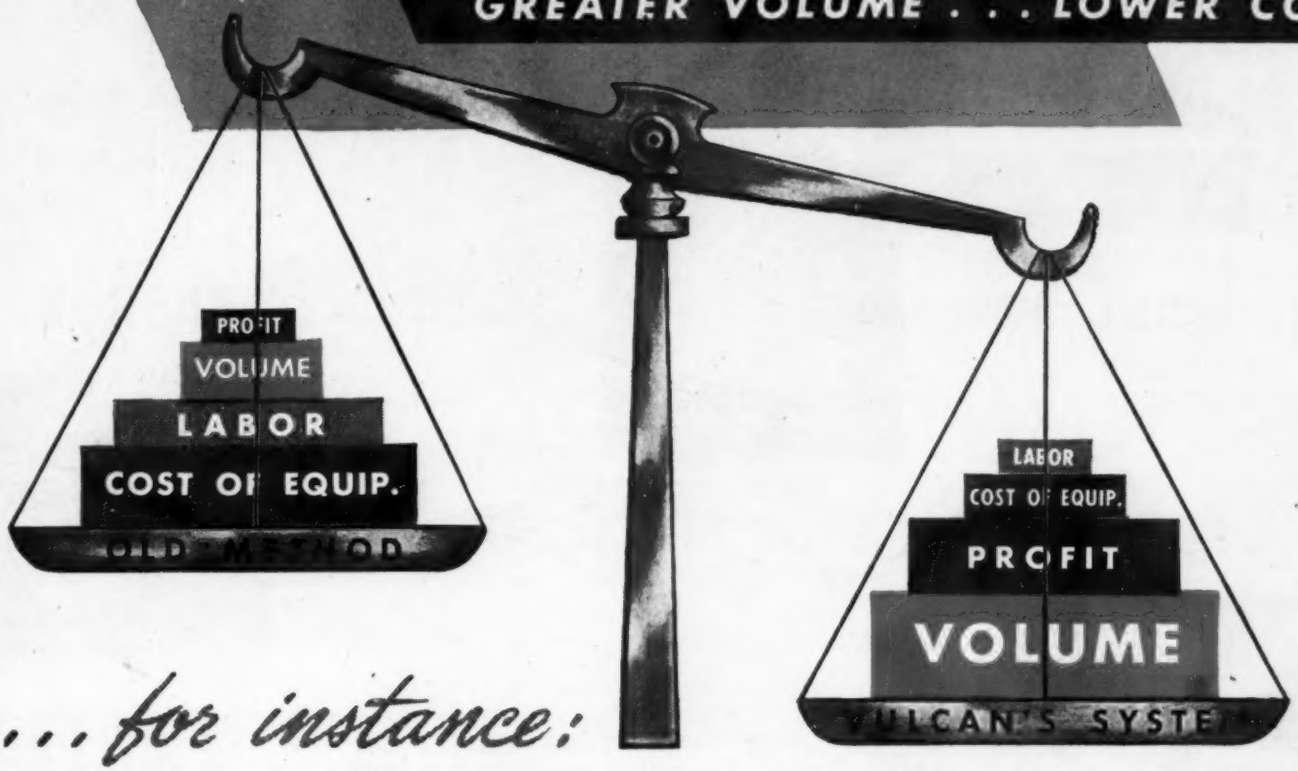
Call the nearest Standard Oil Company (Indiana) office for a Lubrication Engineer. Ask him to make a survey of your plant. He can tell you where you can put Stanoils to work and why you'll get better lubrication.

Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.

STANDARD OIL COMPANY (INDIANA) STANDARD SERVICE

VULCAN'S
HYDRAULIC PIERCING SYSTEM

TIPS THE PRODUCTION SCALE TOWARD
GREATER VOLUME . . . LOWER COST



. . . for instance:

HOLE-PIERCING FLANGE OF REFRIGERATOR DOORS

"This is an honest scale"—here is the factual proof. This Vulcan Hydraulic Hole Piercing Unit frees four punch presses for other work. It eliminates multiple die costs and maintenance. It needs only one operator. Every seven seconds it pierces all holes in the flange of a refrigerator door. It can be quickly adjusted for any door sizes, lefts or rights.

• • •

To meet competition, you need greater volume and lower costs. Vulcan's thirty-two years of experience in designing and building special machinery can help you combine many high cost operations into one low cost job—for instance, a refrigerator door.

Vulcan Tool Co.
DAYTON 10 • OHIO • U.S.A.

Our application engineers, located in strategic areas, will be glad to discuss any of your metal piercing operations in order to lower costs, increase volume.

Vulcan is proud that 87% of its customers for tools, dies, jigs, fixtures are loyal repeaters — (God bless 'em).

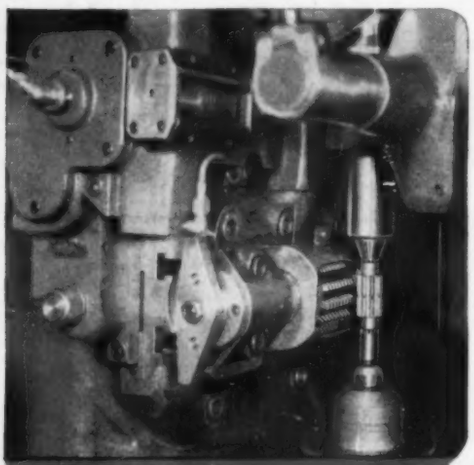
SEE THIS JOB AT THE *Machine Tool Show*

Actual Savings

79% FLOOR-TO-FLOOR TIME
75% IN HOB LIFE

HOBBING 9 TOOTH PINIONS ON TYPE V HOBBING MACHINE

NEW AUTOMATIC HOB SHIFTER CONTROLS WEAR, PRODUCES LONGER HOB LIFE!



● This job record indicates production savings possible with the Barber-Colman Type V Hobbing Machine, taking full advantage of its broad range of feeds and speeds, automatic cycle, and hydraulic operation.

Actual production time, hobbing two pinions per load, was reduced from 2 minutes, 42 seconds to 35 seconds, total floor-to-floor time. Hob speed of 207 RPM was used, with a feed of .125" per revolution of work. Hob life, even at these higher feeds and speeds, jumped from 5,000 to 20,000 pieces because of uniform wear controlled by the Automatic Hob Shifter.

Why will the Type V maintain this kind of production day after day? Because in back of it lies constantly improved design features to minimize wear; ruggedness and accuracy to meet today's requirements for range and capacity; and easy adjustments to keep the machine in perfect mechanical balance at all times. Actually our engineers have designed and built this machine to meet the most rigid demands of any mass-production gear department.

Such production advantages, plus compact, floor-saving design, easy set-up, and ready accessability for maintenance, have made the Type V *priority equipment* for modern, high speed gear production.

Write for production estimates on this machine covering your requirements.

QUICK FACTS

Part—Pinion, 9 teeth, 10/12 Pitch, 1.085" dia. x 55/64" face.
Material—Steel, free machining.
Hob—Double thread, unground 4 x 4 x 1½.
Feed—.125" per rev. of work.
Speed—207 R.P.M.
Floor-to-floor Time—35 seconds per load of two pinions.
Hob Life—20,000 pieces per hob.

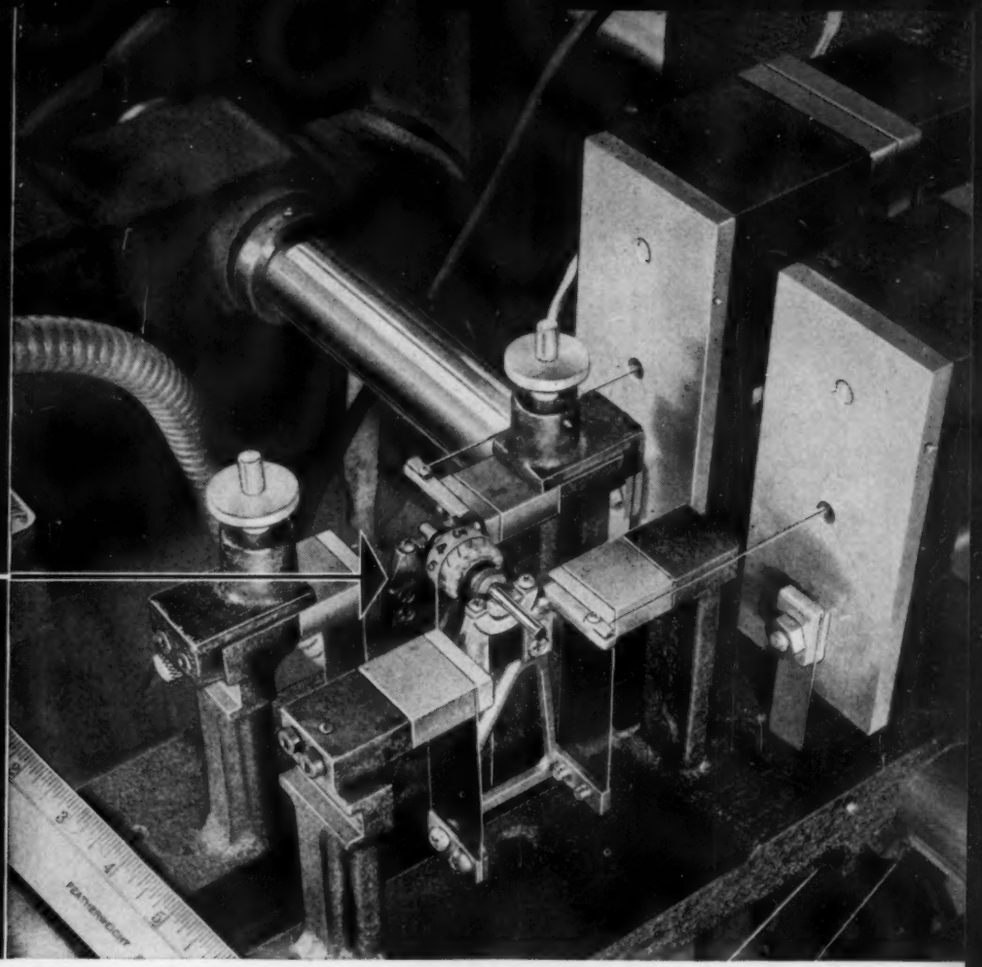
See This Job in Operation at our BOOTH
Machine Tool Show, CHICAGO, September 17-26

ACCURACY-RIGIDITY-POWER BARBER B-C COLMAN FOR HI-PRODUCTION HOBBING

Barber-Colman Company

GENERAL OFFICES AND PLANT 111 LOOMIS ST., ROCKFORD, ILLINOIS, U.S.A.

IS BALANCING ON A DYNETRIC*x important on such small parts?

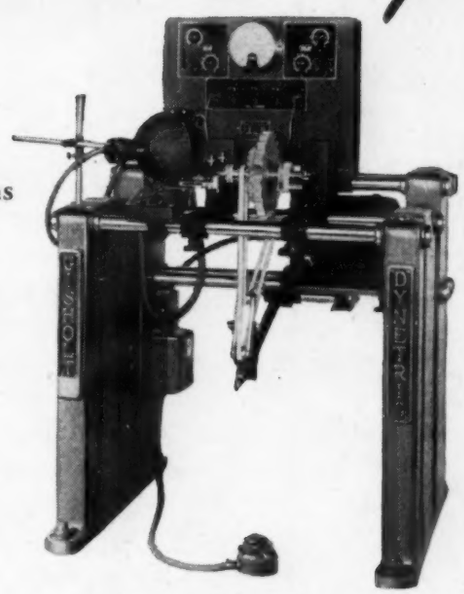


this manufacturer thinks so... here's why...

These tiny induction motors are used to operate record playing and record changing equipment. The manufacturer found that when armatures are not accurately balanced, considerable power is lost at the output shaft of the motor. Still worse, vibration in the record playing equipment not only impairs the tone quality of the machine but also shortens the life of the records it plays.

Where faithful reproduction is so important, is it any wonder the manufacturer protects his product by balancing these vital parts on a Dynetric machine? It is something to look for when you buy a phonograph.

And it is a good time to ask yourself where Dynetric Balancing can improve your product with smoother, quieter, vibrationless operation. Gisholt machines put balancing on a low-cost basis. Ask for the facts about them.



The Gisholt Dynetric 1S Balancing Machine handles parts up to 30 lbs. Other models are available to handle any size part from a fraction of an ounce to many tons. All provide a modern means for quickly measuring *and* locating *unbalance and for accurate correction. Write for literature.*

GISHOLT MACHINE COMPANY
Madison 3, Wisconsin

**Developed jointly with Westinghouse Electric Corporation*
x Trade-Mark Reg. U.S. Pat. Off. by Westinghouse Electric Corp.

turret lathes • automatic lathes • superfinishers
balancing machines • special machines

THE GISHOLT ROUND TABLE
represents the collective experience of specialists in the machining, surface finishing and balancing of round or semi-round parts. Your problems are welcomed here.

"UNBRAKO" SOCKET SET SCREW WITH KNURLED CUP POINT

The knurled cup point of this "Unbrako" makes it a Self-Locker—the point digs in and holds fast, even when subjected to the most chattering vibration.

Pat'd. and Pats. Pend.

"UNBRAKO" SOCKET SET SCREW WITH KNURLED THREADS

The knurled swaged threads make this screw a Self-Locker, too, for Flat, Cone, Oval, One-Half and Full-Dog Points.

Pat'd. and Pats. Pend.

"FLEXLOC" SELF-LOCKING NUT

A Self-Locking All-Metal, One-Piece Nut. Every thread, including the locking threads, takes its full share of the load, and it sure does lock. Available in sizes #6 to 1" in diameter—millions in use.

Pat'd. and Pats. Pend.

"HALLOWELL" KEY KIT

Kits. Pats. Pend.

You can't screw socket screws in or out without a hex socket wrench, so why not get our No. 25 or No. 50 "Hallowell" Hollow Handle Key Kit which contains most all hex bits.

Reg. U. S. Pat. Off.

BY SPECIFYING UNBRAKO KNURLED SOCKET HEAD CAP SCREWS *YOU SAVE ASSEMBLY TIME*

The Knurled Head speeds assembly because it provides a slip and fumble-proof grip—though the fingers and head be ever so oily—therefore, you can screw it in faster and farther before it becomes necessary to use a wrench. The Internal Wrenching feature facilitates compact designs . . . reduces weight and costs. "Unbrako" Knurled Socket Head Cap Screws are available in sizes from #4 to 1½" in diameter and in a full range of lengths. Write for your copy of the "Unbrako" Catalog.

"Unbrako" and "Hallowell" Products are sold entirely through Industrial Distributors.

OVER 44 YEARS IN BUSINESS

STANDARD PRESSED STEEL CO.

JENKINTOWN, PENNA., BOX 4 • BRANCHES: BOSTON • CHICAGO • DETROIT • INDIANAPOLIS • ST. LOUIS • SAN FRANCISCO

IT TAKES PRECISION EQUIPMENT

to make PRECISION TOOLS

P&W JIG BORER

Pardon our pride: We are only human. We like the "open-armed welcome" that is so evident each time a new P&W Jig Borer goes to work in a toolroom. We like the universal pride and enthusiasm our customers voice — the confident smiles of operators who will use this precision machine for precision work. It's a proud day for everyone, when a new P&W Jig Borer moves into a toolroom.

YOU can't afford to gamble if you are making precision tools and fixtures. Wages and materials cost too much. You need dependable precision machine tools that will do the job quickly and accurately the first time.

Precision boring is a major toolroom job that used to be headache number one back in the early twenties. Today it's still a major job, but the headache vanished years ago when the Pratt & Whitney Jig Borer solved the problem. The constantly improved P&W Jig Borer has been the accepted standard of precision in toolrooms ever since.

Performance and reputation are the best references for a machine tool. In hundreds of shops the P&W Jig Borer has justified its reputation for fast precision boring on jobs ranging from small drill jigs up to and beyond the large punch and die set shown here. You know at a glance the accuracy that *must* be built into a job like this. Yet it's all in the day's work for the shop that has the right precision boring equipment.

You need to see the P&W Jig Borer in action to know all it can do. We can tell you of a nearby installation which we can arrange for you to visit. At our own factory we can show you the exquisite precision we build into every part. We will be glad to send you complete literature. If you do precision boring you need to know the Pratt & Whitney Jig Borer.

PRATT & WHITNEY

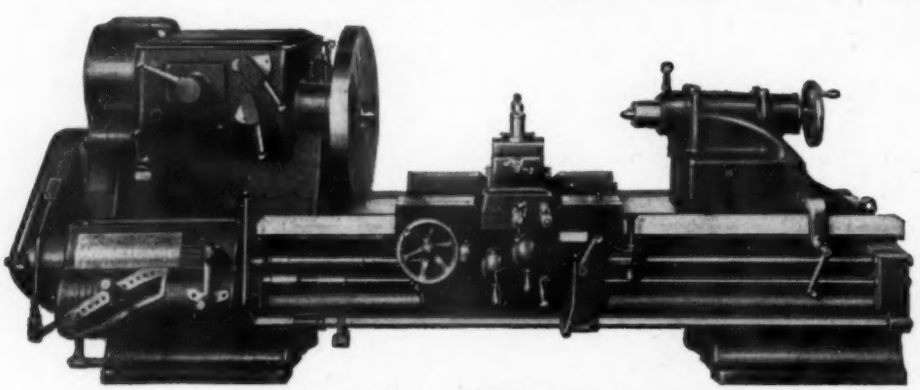
Division Niles-Bement-Pond Company

WEST HARTFORD 1, CONNECTICUT

Massive—

Springfield 30" Medium Duty Geared Head Lathe

To handle those big jobs *and* the smaller ones choose Springfield Geared Head Lathes. Long, accurate performance is "built in" with the deep well-ribbed bed, with the nickel and chrome steel used and with the powerful massive design. Thirty-six changes of threads and feeds are available in the 30" lathe. Reverse gears are arranged to produce right- or left-hand threads without the use of wrenches and with a minimum of effort. Lead screws are tested to .001 inch to the foot and are used only for threads. A feed rod is supplied for all feeds.



When in need of a 30" lathe, write us for Bulletin 165.

THE SPRINGFIELD MACHINE TOOL COMPANY

SPRINGFIELD **OHIO, U.S.A.**

G-E ELECTRONIC HEATER STRAIGHTENS KINK IN MILK-CAN PRODUCTION LINE

THE JOB...

One of the operations in the manufacture of milk cans in the Buhl Manufacturing Company, Detroit, Mich., requires annealing milk-can necks for the purpose of forming rolled lips.

THE OLD METHOD...

The cans were removed from the production line and the entire upper portion of the milk can was furnace annealed—a step which required two men. Following this time-consuming operation, the cans were pickled to remove scale and returned to the production line for further processing.

THE NEW INDUCTION METHOD

A G-E 15-kw electronic induction heater with a two-position fixture was installed directly in the production line, where one man now performs the entire annealing process. At one position, approximately one inch of the neck is brought to annealing temperature in the short time of 12 seconds, while the second position is being unloaded. By means of a transfer switch, power is applied to the other station, which has been reloaded.

HERE'S WHAT INDUCTION HEATING HAS DONE FOR THIS COMPANY—

1. **Increased production**—by making manufacture a continuous process—cutting annealing time to seconds—eliminating pickling.
2. **Cut costs**—by requiring less time and labor per unit.
3. **Better product**—by localizing annealing to the neck, giving the rest of the can greater resistance to denting or damage.

GENERAL ELECTRIC

WHAT CAN ELECTRONIC INDUCTION HEATING DO FOR YOUR PRODUCT?

We would welcome the opportunity to give you an unbiased answer to this question. Simply get in touch with the Heating Specialist in the nearest G-E Office. In the meantime, send the coupon for our free bulletin GES-3290A, "The How and What of Electronic Induction Heating."

Apparatus Department, Sect., F675-152
General Electric Company
Schenectady 5, N. Y.

Please send me your free bulletin GES-3290A, "The How and What of Electronic Induction Heating."

Name.....

Company.....

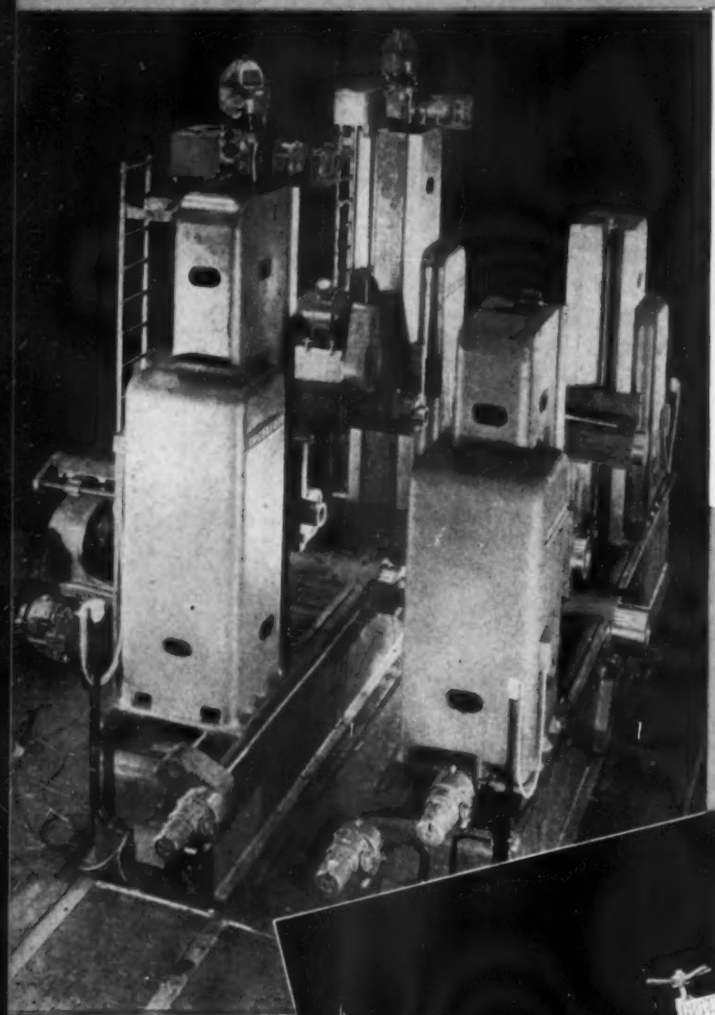
Address.....

City..... State.....

87A4

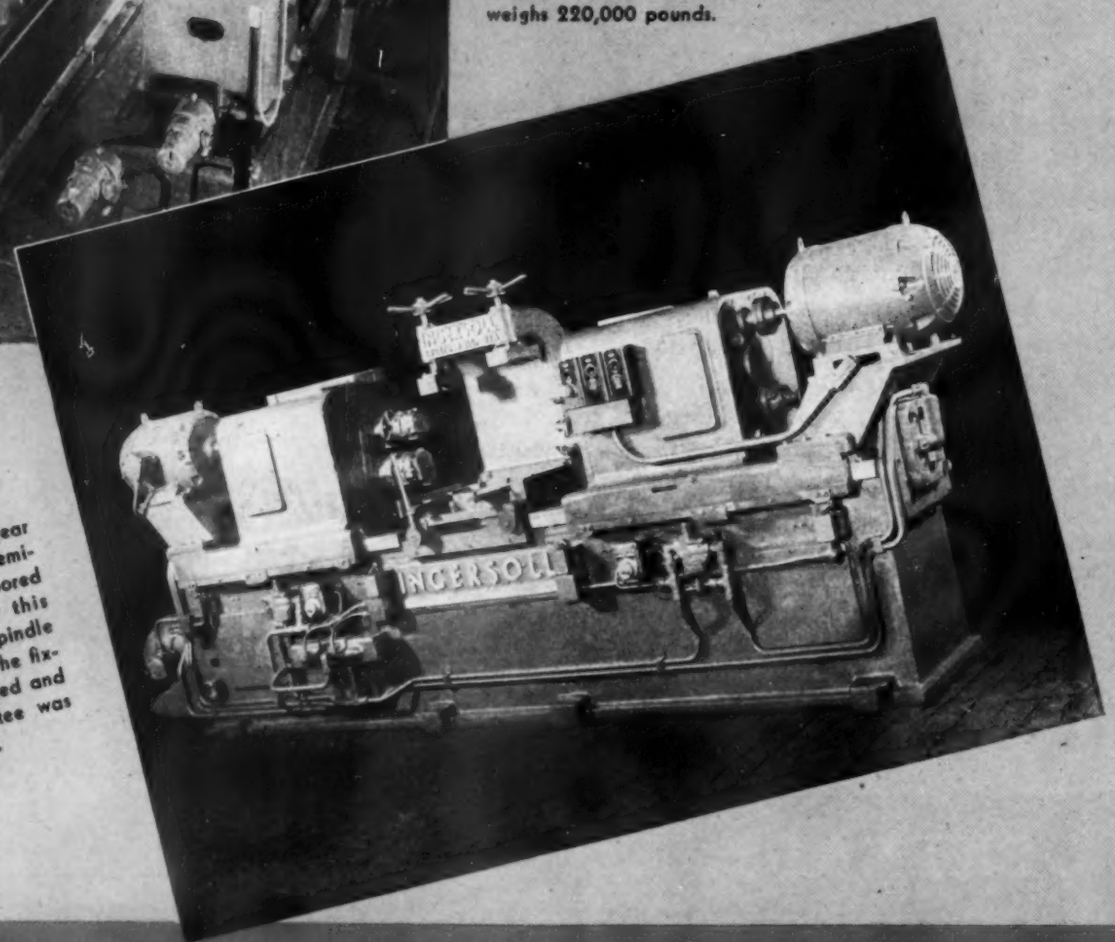
...SPECIAL INGE

MACHINES • FIX



One out of every three machines shipped by the Ingersoll Milling Machine Company in the last year was a boring machine. The examples shown on these two pages are typical of these machines.

A large gear case, built for the Navy during the war, is 11 feet wide, 16 feet long and 9 feet high. This Ingersoll 3-Spindle Boring Machine was specially built to handle this massive work. The complete installation weighs 220,000 pounds.



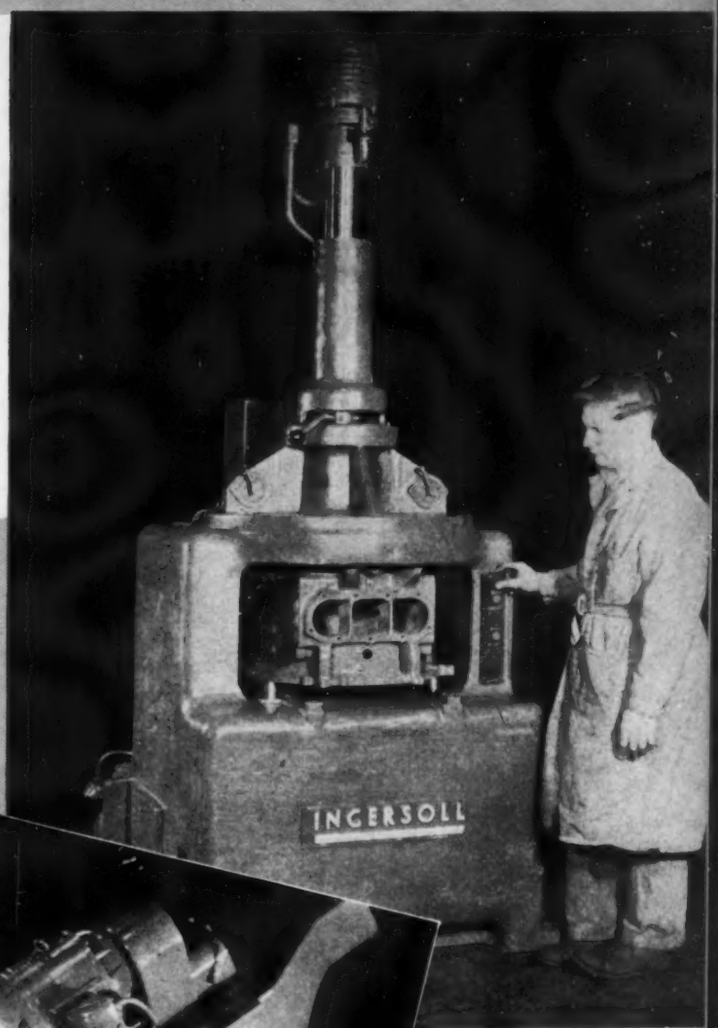
The main bores on gear cases are rough and semi-finish bored, counterbored and chamfered by this 2-Way Ingersoll 4-Spindle Boring Machine. The fixture is hand operated and production guarantee was 43 cases per hour.

THE INGERSOLL MILLING

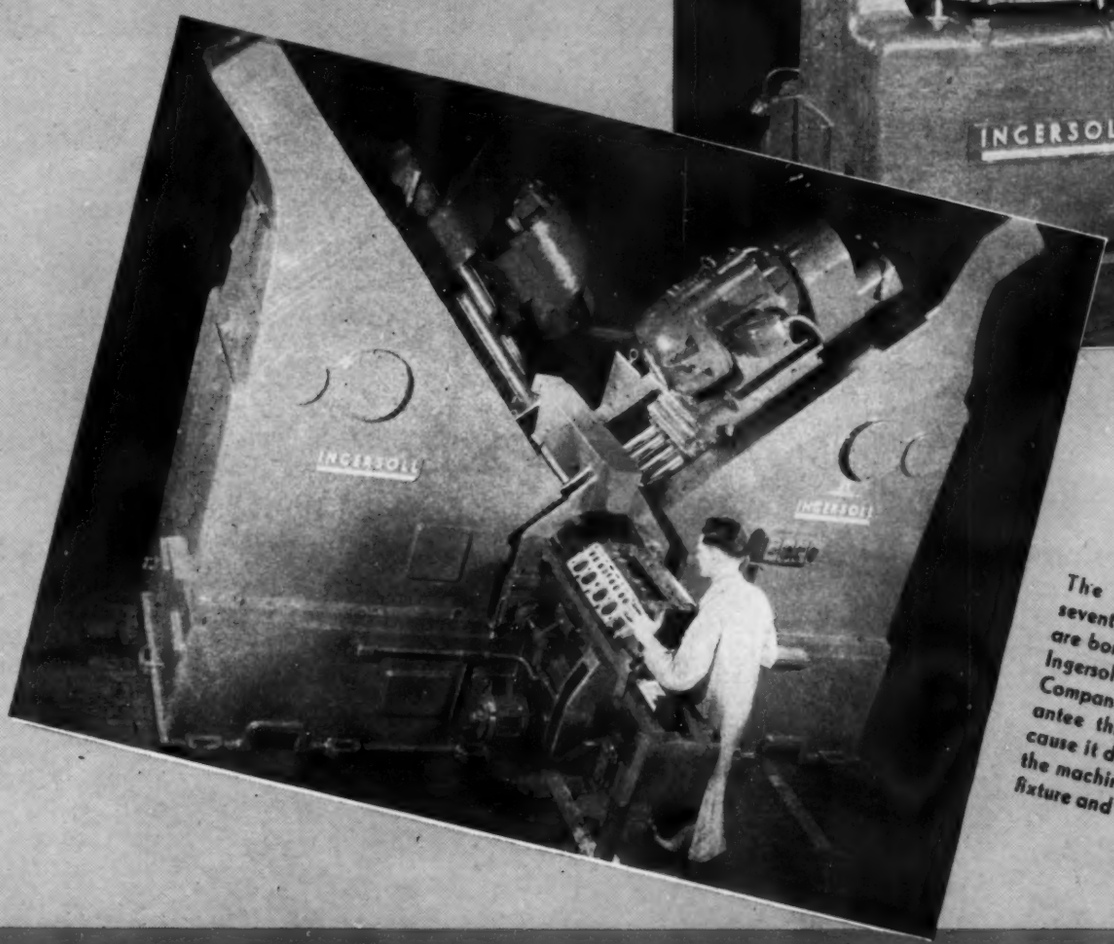
RSOLL BORING

TURES • CUTTERS

Each machine, complete with fixture and cutters, is specially designed to do a particular job. To be able to design and build the complete installation is an engineering advantage of value and one of our greatest assets.



Specially designed for accurate boring of bronze bushings in blower crankcases at the rate of 11 per hour, this Ingersoll Boring Machine weighs only 3,400 pounds and is driven by a ½ H.P. motor.



The cylinder holes in seventy V-8 motor blocks are bored every hour. The Ingersoll Milling Machine Company was able to guarantee this production because it designed and built the machine, the automatic fixture and the boring tools

MACHINE CO., ROCKFORD, ILLINOIS

Action and Power with "SUPERSOCKETS"

● When you want *action* and the safety of sure-gripping *power*, you can't beat Williams "Supersockets." These versatile wrenches, with their various combinations of handles, parts and socket types, provide greater speed even under adverse working conditions.

Williams "Supersockets" are available in 5 different patterns, with drives ranging from 1/4" to 1" square. Socket openings range from 3/16" to 3 1/8". Sold by Industrial Distributors everywhere.

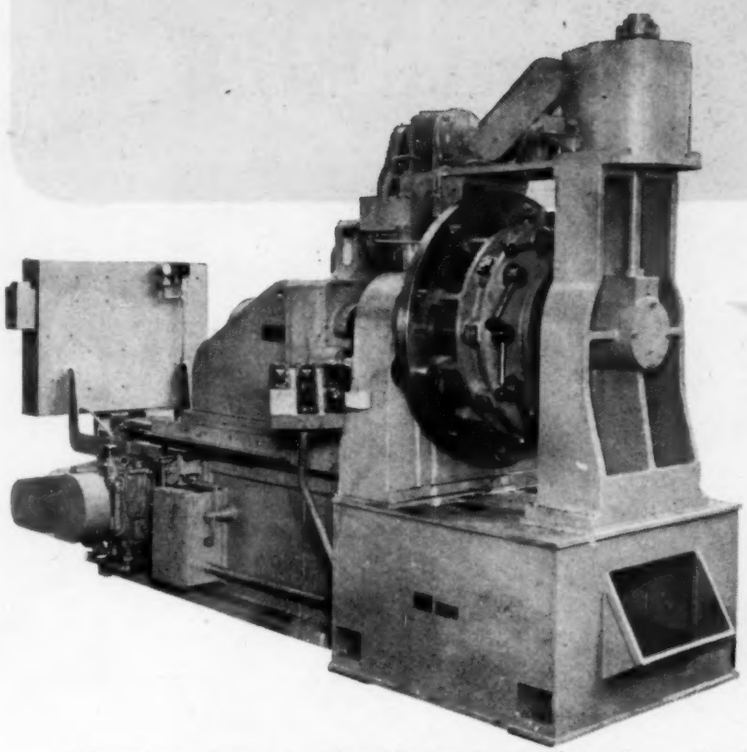
J. H. WILLIAMS & CO., Buffalo 7, N. Y.

WILLIAMS

DROP-FORGINGS AND DROP-FORGED TOOLS

Again BAKER does it Better

...Increases Productivity!

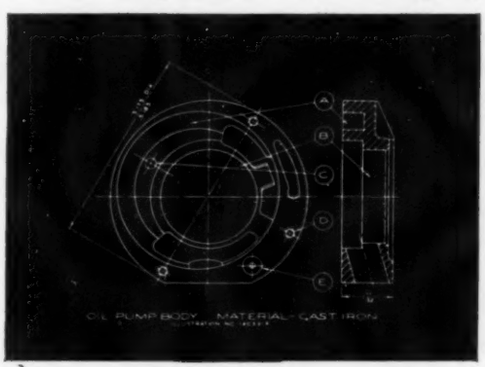


One Way Machine

HANDLES MULTI-OPERATIONS AT ONE CHUCKING

Here's another example of Baker ingenuity and know-how simplifying production—making possible increased output per man and per machine!

This Baker Machine is a Model 3½ x 24 Floor Type Hydraulic Feed Unit built into a one-way Multi-Spindle with rotary index trunnion fixture. The part handled is an oil pump body. Machine is designed to perform all operations at one chucking, part not leaving fixture until all operations at each station are performed. Saddle carrying accurate multi-spindle head mounted on bars. Automatic power index to trunnion fixture. Consult with Baker concerning your productivity-problems.



NOTE ECCENTRIC PATH MACHINING

Here is the sequence of operations on the oil pump body shown at left at the ten stations of the machine:

Station No.	Operation
1	Load and unload the part.
2	Rough out Eccentric Pathway "A".
3	Semi Finish Eccentric Pathway "A".
4	Rough Bore and Rough Counterbore "B".
5	Semi Finish Bore and Semi Finish Counterbore "B".
6	Spot Drill .500" diameter one hole "E". Chamfer 5/16" diameter three holes "D".
7	Drill 15/32" diameter one hole "E".
8	Drill .2656 diameter one hole "C". Drill ⅛" diameter one hole "E". Drill .2631 diameter three holes "D".
9	Ream .500" diameter one hole "E". Tap ¼"-20NC with Lead Screw Tapper three holes "D".

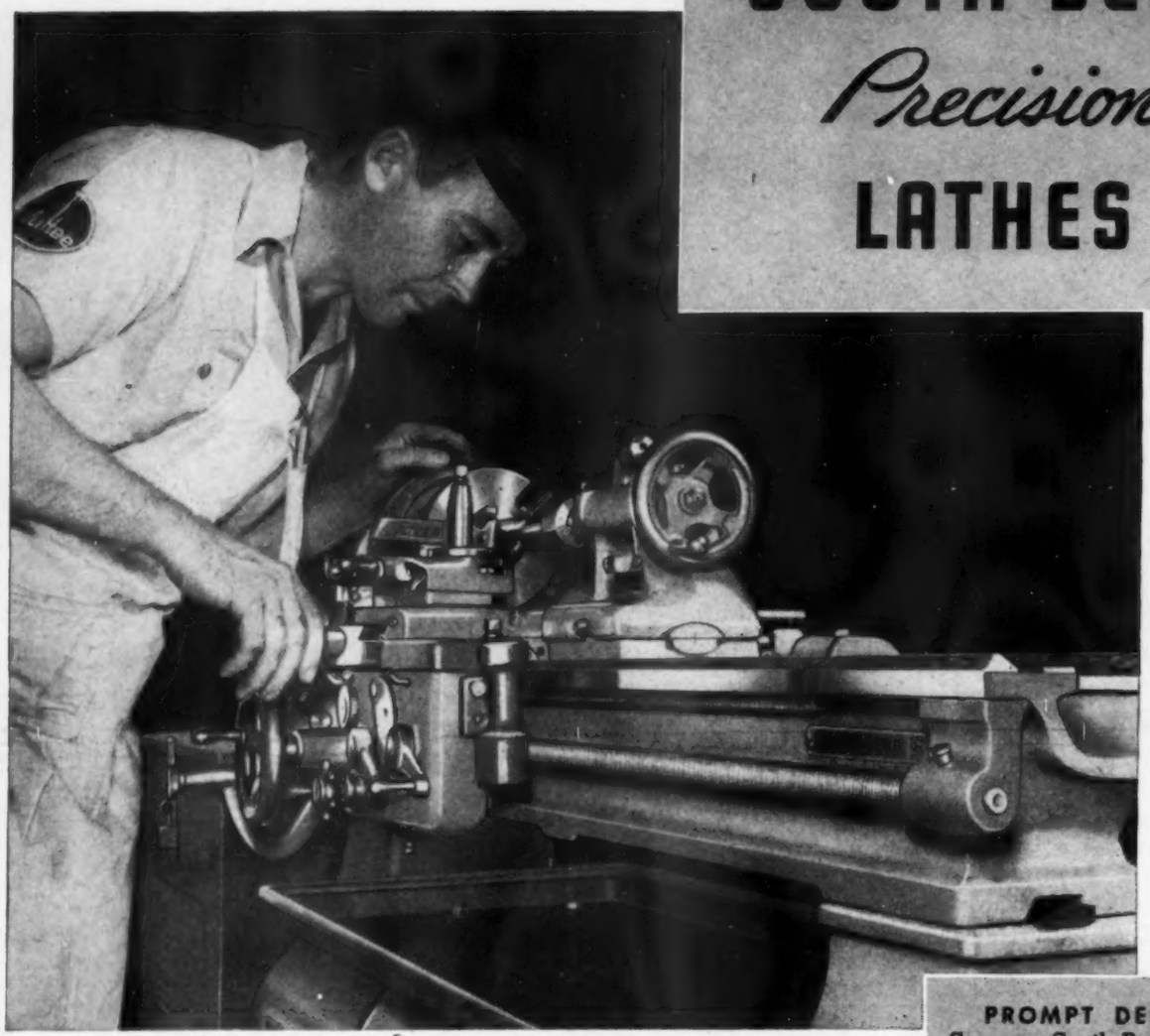
See us at MACHINE TOOL SHOW Chicago—Sept. 17-26 BOOTH 639

BAKER BROTHERS, Inc. TOLEDO OHIO

DRILLING... TAPPING... KEYSEATING... CONTOUR GRINDING MACHINES

TO INSURE ACCURACY, USE—

SOUTH BEND *Precision* LATHES



South Bend Lathes help to increase plant efficiency and profits by raising precision standards both in the toolroom and in the production shop.

These lathes are designed and built to work to close tolerances and produce a smooth finish, for ease and speed of operation, and to give long, dependable service. Versatile, too, they are capable of performing a wide variety of operations on all types of machinable materials with a minimum of change-over and set-up time. Attachments are available which help to simplify and speed tooling for special classes of work, and in many instances eliminate the need for special fixtures.

South Bend Quick Change Gear and Toolroom Lathes are made with 9", 10", 13", 14½", 16", and 16/24" swings. Turret Lathes have ½" and 1" maximum collet capacities, 9", 10", and 16" swings. For further information contact your South Bend Lathe distributor or write for Catalog stating size lathe you require.

PROMPT DELIVERY

See your South Bend distributor today—immediate delivery from his stock or early delivery from factory.

PRICES

Starting at $145.00, f. o. b. factory, South Bend Lathes now represent a greater value per dollar of cost than ever before. Average price increase over prewar level is less than 15%.

TIME PAYMENT

South Bend Lathes and attachments are available on Factory Time Payment terms. 25 per cent down payment, 12 months to pay. Moderate finance charge.

SOUTH BEND LATHE WORKS

BUILDING BETTER LATHES SINCE 1906

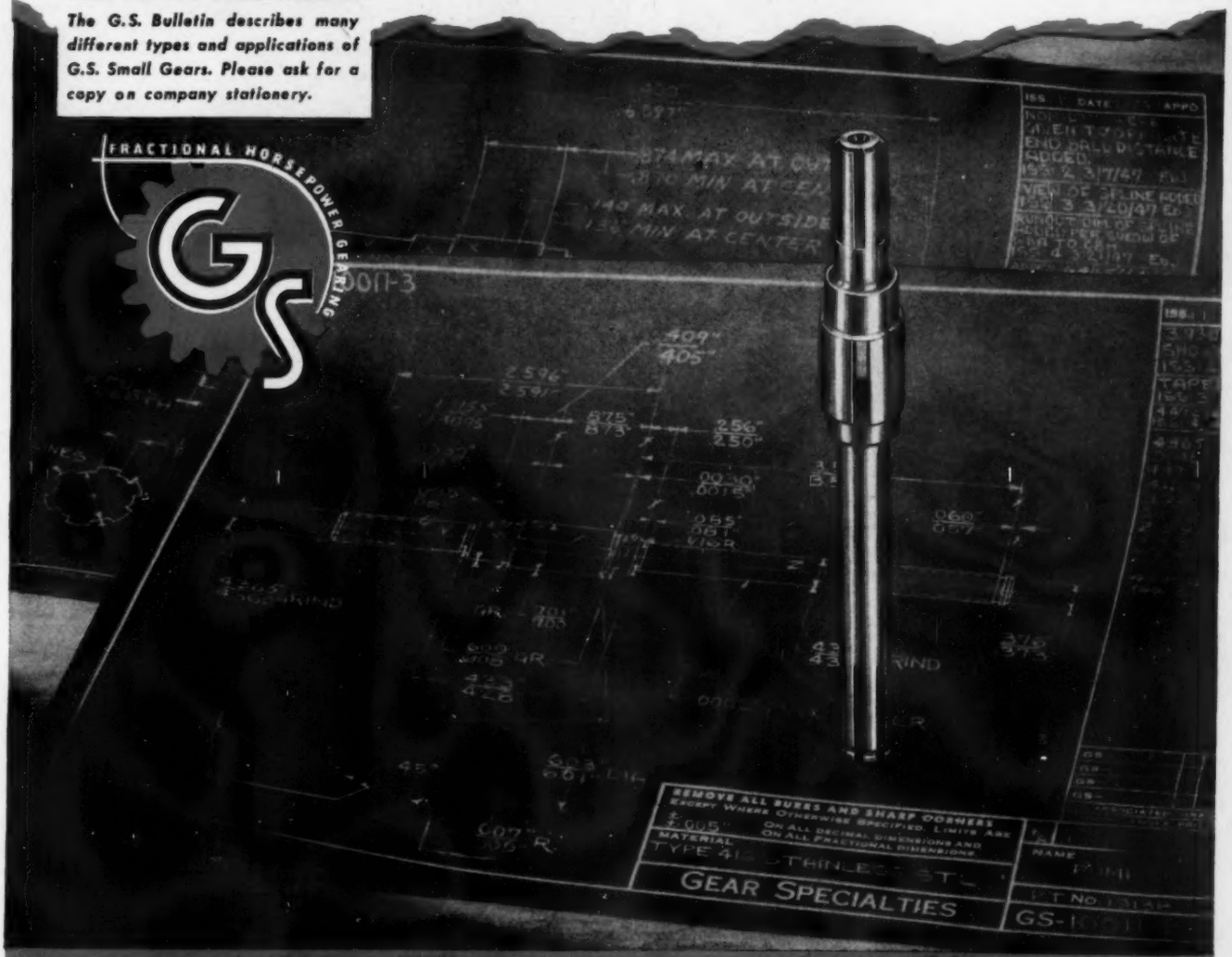
419 EAST MADISON STREET • • • SOUTH BEND 22, INDIANA

GET THE FRIENDLY COOPERATION OF EXPERTS

If a small gear problem is involved, "put it up to G.S.!" Get the valuable aid that only a highly trained staff of Fractional Horsepower Gear *Specialists* can give. They'll gladly suggest any necessary changes in design that will tend to improve its operation or make it more economical to produce in quantity. The G.S. organization of Small Gear Craftsmen offer you a combination of specialized skills, long experience and mechanical facilities unequalled in the history of the industry. We regularly serve many of America's biggest and most particular Small Gear users. Will you tell us, please, just how we can best serve YOU?

SEND FOR OUR 4-PAGE BULLETIN

The G.S. Bulletin describes many different types and applications of G.S. Small Gears. Please ask for a copy on company stationery.



GEAR Specialties

Spurs • Spirals • Helicals • Bevels • Internals • Worm Gearing • Racks • Thread Grinding

2635 WEST MEDILL AVENUE • CHICAGO 47, ILLINOIS

MEMBER OF AGMA

WORLD'S LARGEST EXCLUSIVE MANUFACTURERS OF FRACTIONAL HORSEPOWER GEARS

RIVETT

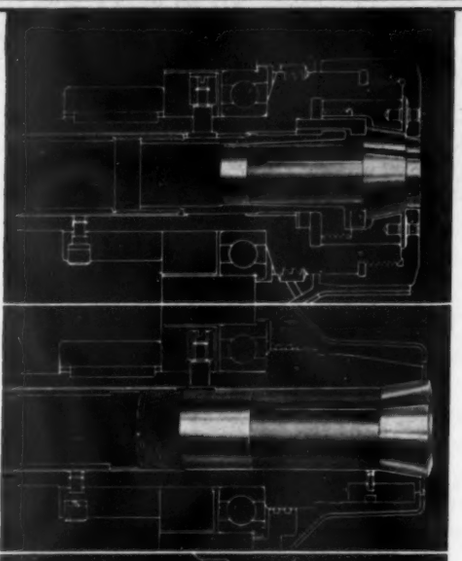
WHEN
COSTS AND QUALITY COUNT
THE *New* 918S TURRET LATHE

If you machine small and medium sized parts from bar stock or on second operations – look to this new Rivett Turret Lathe. It is designed to buy its way into your plant with cost savings and quality control.

The 918S Turret Lathe cuts the initial cost of investment by taking work from larger machines. It follows by reducing the "dead time" of set-up and spoilage on every job. Then it really pays with lowered time on every piece. How? – With the right spindle speed for efficient tooling, with quick means for chucking work, with properly grouped control levers and by reducing operator fatigue.

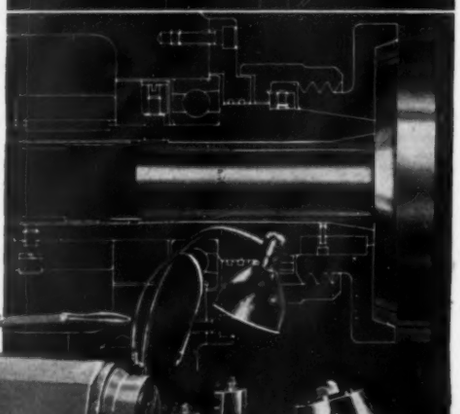
Features designed into the 918S Turret Lathe to guard quality include a rigidly mounted precision ball bearing spindle, precise tool indexing, hardened and ground steel bedways, vibration-free drive and mounting.

Write for Bulletin 918-ST



Stationary Collet – closes without lateral movement to maintain perfect lengths on bar stock. Maximum capacity ⅞" round.

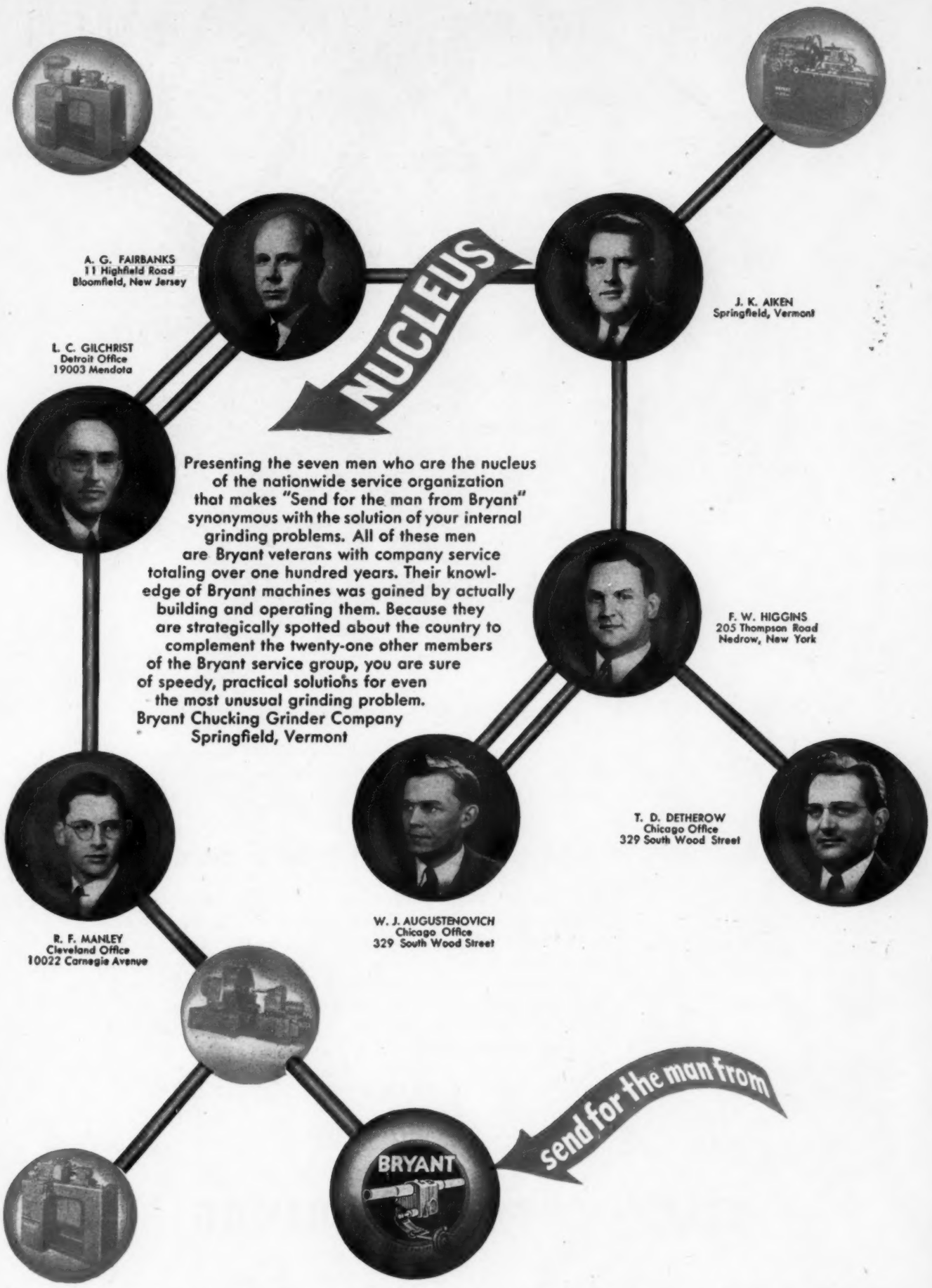
Draw-In Collet – new design holds work truer with greater gripping power. Maximum capacity 1⅛" round.



Step Chuck – for accurate chucking of circular or irregular parts requiring only a short grip. Maximum capacity 6" round.

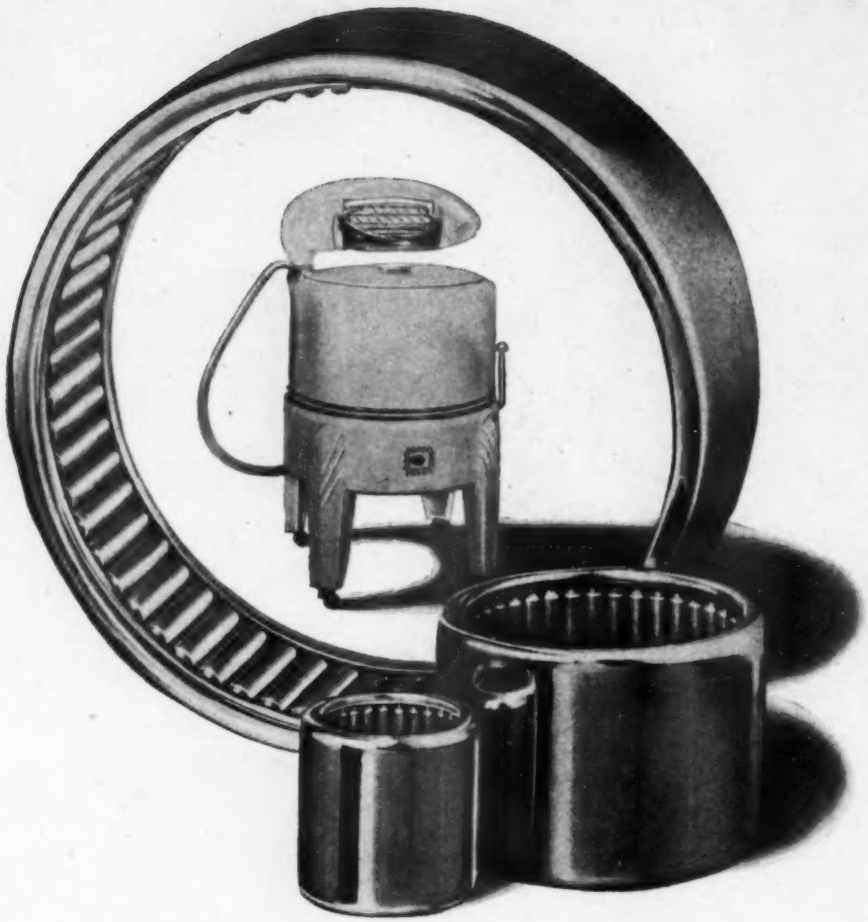
RIVETT LATHE & GRINDER, Inc.

BRIGHTON · BOSTON · MASS · U.S.A.



Presenting the seven men who are the nucleus of the nationwide service organization that makes "Send for the man from Bryant" synonymous with the solution of your internal grinding problems. All of these men are Bryant veterans with company service totaling over one hundred years. Their knowledge of Bryant machines was gained by actually building and operating them. Because they are strategically spotted about the country to complement the twenty-one other members of the Bryant service group, you are sure of speedy, practical solutions for even the most unusual grinding problem.

Bryant Chucking Grinder Company
Springfield, Vermont



Focus attention on your product...

by prolonging its service life, increasing its efficiency and dependability, and reducing operating and maintenance costs. These advantages can be obtained

Through improved anti-friction performance...

provided by compact, high-capacity Torrington Needle Bearings. Wear is virtually eliminated through the even distribution of loads over the full complement of small diameter rollers. Power requirements are reduced to a minimum by Needle Bearings' low coefficient of starting and running friction. Lubricant lasts longer, efficiently retained by the turned-in lips of the outer shell.

Let our engineering staff assist you in the application of Needle Bearings for the improvement of your product.

THE TORRINGTON COMPANY

TORRINGTON, CONN. SOUTH BEND 21, IND.

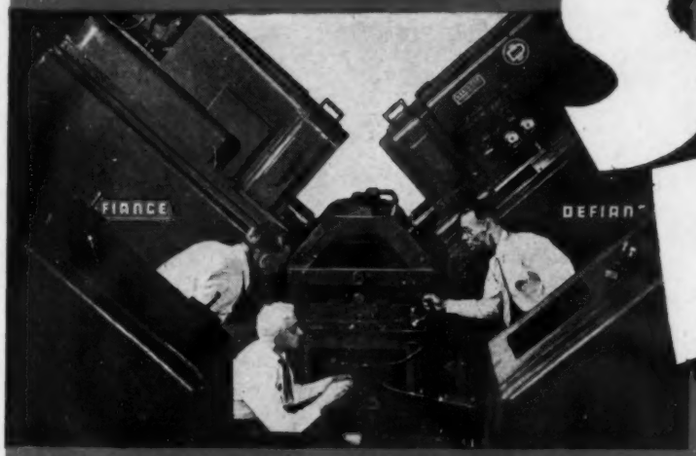
Offices in All Principal Cities

TORRINGTON BEARINGS

• NEEDLE • SPHERICAL ROLLER • STRAIGHT ROLLER • TAPERED ROLLER • BALL •

DEFIANCE MACHINES designed to help you

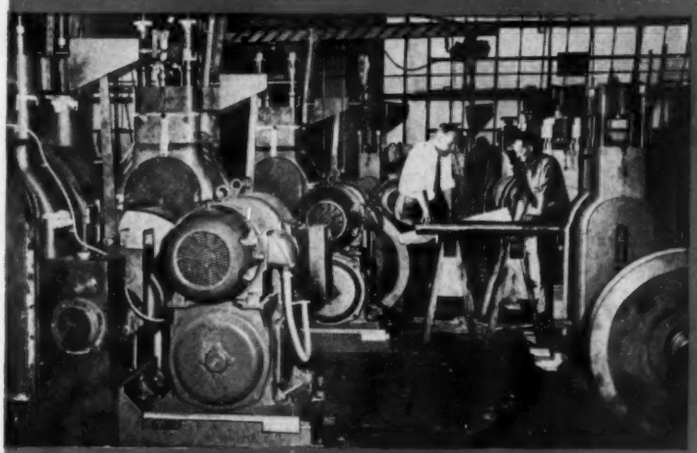
Save Labor!



Eight of these Defiance Machines in a series handle machining of valve holes and inserts in the manufacture of V-Type motors.

Faster production with Defiance Machines helps you *save labor* and *cut costs* . . . while maintaining close-tolerance *accuracy!* Also, there's less downtime because of Defiance dependability.

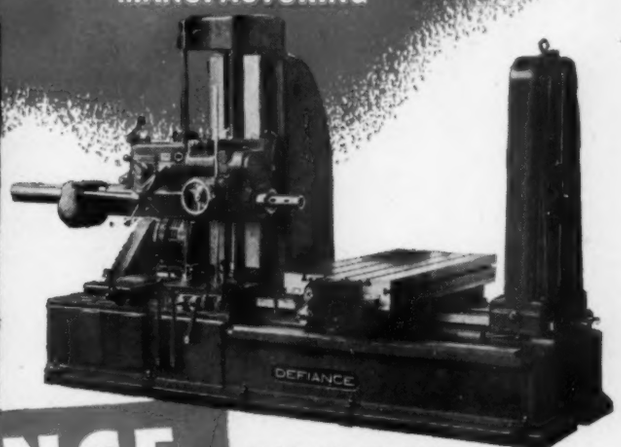
These are the finest heavy machines for boring, milling, drilling and tapping. Produced in a modernly equipped plant . . . where accuracy has been the watchword for 97 years. Now more than ever you need Defiance labor-saving Machines! Write concerning your requirements. Defiance Machine Works, Inc., Defiance, O.



Defiance-built preform presses for the plastics industry do the job *faster* —with less manpower. Shown here in assembly department at Defiance.

97 YEARS OF PRECISION MANUFACTURING

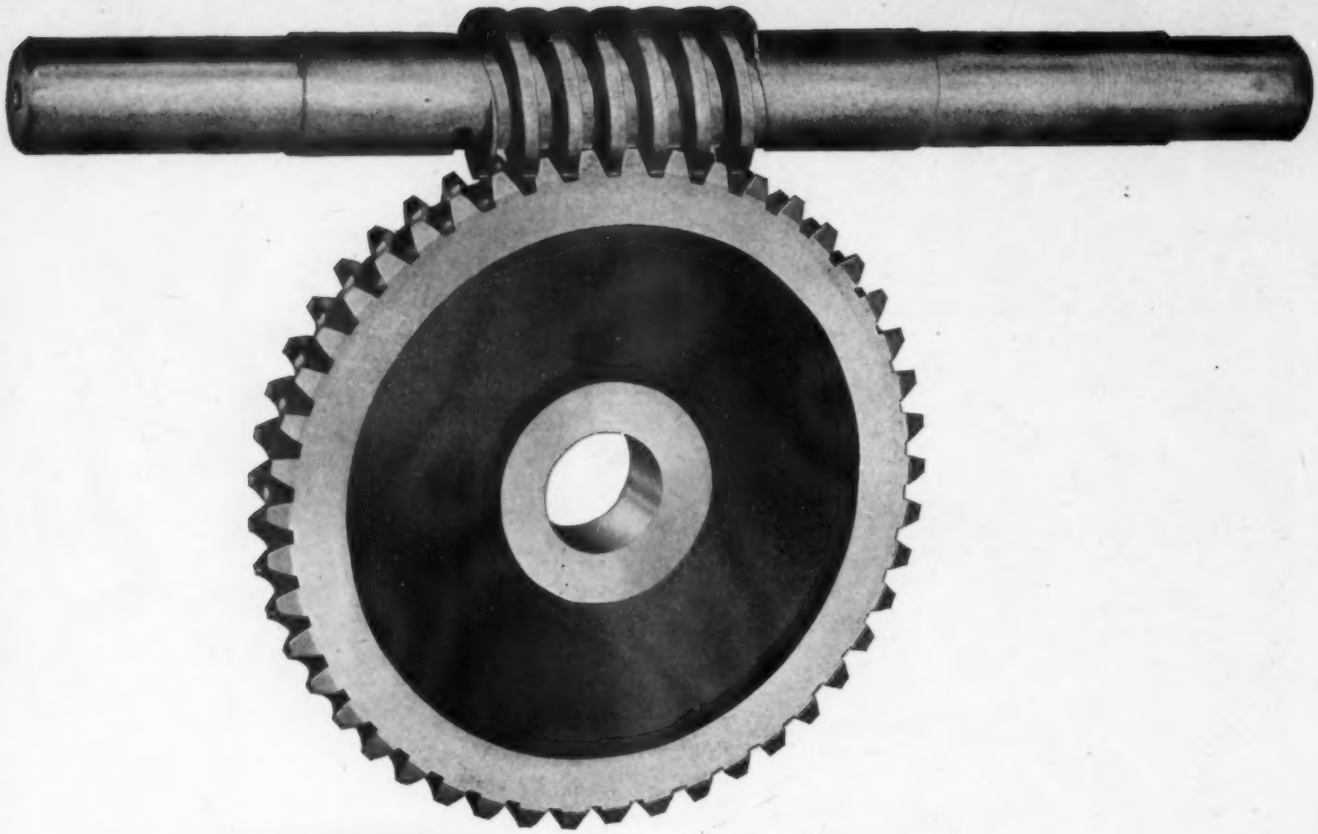
Modernly equipped plant at Defiance.



Defiance No. 25A Horizontal Boring Machine is designed with outboard bearing supports allowing maximum cross travel without sag. It has a 3¼" bar . . . 20 speeds range from 12 R.P.M. to 1000 R.P.M. . . . 30" x 60" table. Oversize construction insures rigidity.

DEFIANCE

BORING . . . MILLING . . . DRILLING TAPPING MACHINES



Here are just a few of the many products on which ADAMS GEARS are being used . . . .

Machine Tools • Aircraft

Motor Trucks • Diesel Engines

Farm Machinery

Road Machinery • Tractors

Printing Machinery

Speed Reducers

You'll get smoother, more efficient operation for your product with *Adams Gears!*

"Tailor-made" gears designed especially for the job provide the opportunity to improve the performance standards of your product. Built for the product, they often simplify assembly and reduce production costs, too. Here at Adams we are specialists in making gears that meet your specifications exactly. Care and control exercised at every stage in their manufacture assure smooth, efficient power transmission. Write for further details.

THE ADAMS COMPANY, 1942 Bridge St., Dubuque, Iowa

The ADAMS Compa
Dubuque, Iowa, U. S. A.

GEARS

FINE GEARS MADE TO YOUR SPECIFICATIONS . . . . . ESTABLISHED 1883

Difficult?

not with a ROCKFORD Hy-Draulic

The "difficult" jobs are never a problem when you have a Rockford Hy-Draulic Shaper. Put on any of the special jobs that are often tough to set-up or do . . . and see how fast and accurately such work can be done. The special job shown here on a production part for a South Bend Lathe is typical . . . a keyway only 0.500″ long. In addition to cutting accurately to a blind shoulder at each end with only a clearance of 0.008″, the cut must be held to plus or minus 0.003″ in width and depth. These parts are produced in lots of 250 to 3000 pieces and the keyways are cut in an average time of 30 seconds per piece. If you want speed, accuracy, and true ease in set-up and operation, for every kind of shaper work, investigate the Rockford Hy-Draulic. Write for Shaper Bulletins.

ROCKFORD MACHINE TOOL CO.
ROCKFORD ILLINOIS

1947 Machine Tool Show

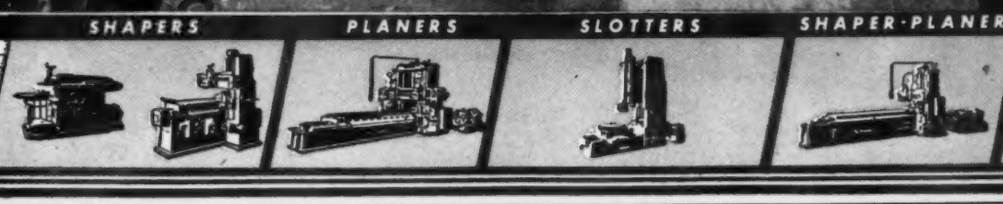
4709

ROCKFORD Hy-Draulic SHAPERS

• • • •

Ram type Shapers are built in 12″, 16″, 20″, 24″ special, 24″, and 28″ sizes . . . Openside Shaper in 36″ size. Available with all accessory equipment where it applies, such as universal table and power down feed.

Hy-Draulic



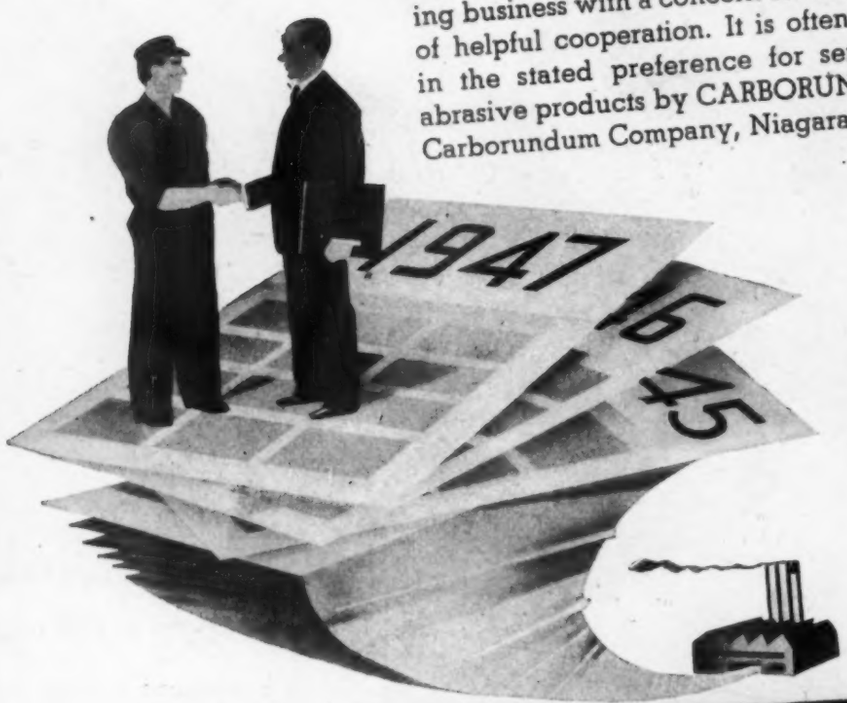
A BUYING GUIDE FOR ABRASIVES

POINT No. 7

SATISFIED USERS

When satisfied customers are the yardstick by which a concern is evaluated, The Carborundum Company measures up well. During the many years it has supplied abrasive tools to industry... the opinions, needs and viewpoints of those it serves have been deeply respected. The results of this policy are reflected in the high regard in which the name CARBORUNDUM is held by users of abrasives.

There's a certain feeling of satisfaction in doing business with a concern on this high level of helpful cooperation. It is often expressed in the stated preference for services and abrasive products by CARBORUNDUM. The Carborundum Company, Niagara Falls, N.Y.



CARBORUNDUM

A Good Rule for Good Grinding

Specialized wheels by CARBORUNDUM for thread grinding.
Cutting-off wheels . . . the modern tool for faster, less costly, more finished cuts.
Cool-cutting green grit wheels for cemented carbide.
Diamond wheels to meet stiffer technical needs.
A coated abrasive for every sanding and finishing condition.
All standard shapes are supplied in grinding wheels by CARBORUNDUM

. . . CALL IN **CARBORUNDUM** TRADE MARK

● BONDED ABRASIVES ● COATED ABRASIVES ● ABRASIVE GRAINS AND COMPOUNDS

FOR THE SURFACE GRINDER WITH *ALL* THE WORTH WHILE FEATURES

-Get a HILL

Here is a surface grinder built in two types, Horizontal Spindle or Vertical Spindle with—

- *Open Side Accessibility*
- *100% Hydraulic Table Drive*
- *Built-in Spindle Motor*
- *Centralized Accessible Controls*
- *Low Pressure Hydraulic System*
- *One Shot Lubrication*
- *Adequate Safety Devices*

• The "HILL" Vertical Spindle Grinder for rapid stock removal and accurate grinding of flat surfaces —recommended for accuracy, speed and finish— features that mean increased precision production. Made in table widths of 18", 24" and 30" with table lengths from 5 to 20 feet.

• The "HILL" Horizontal Spindle Grinder for a wide range of grinding — flats, angles, irregular and special shaped surfaces — ideal for maintaining close tolerances with superior finish. Made in table widths of 18", 24", 30" and 36" with table lengths from 5 to 20 feet.

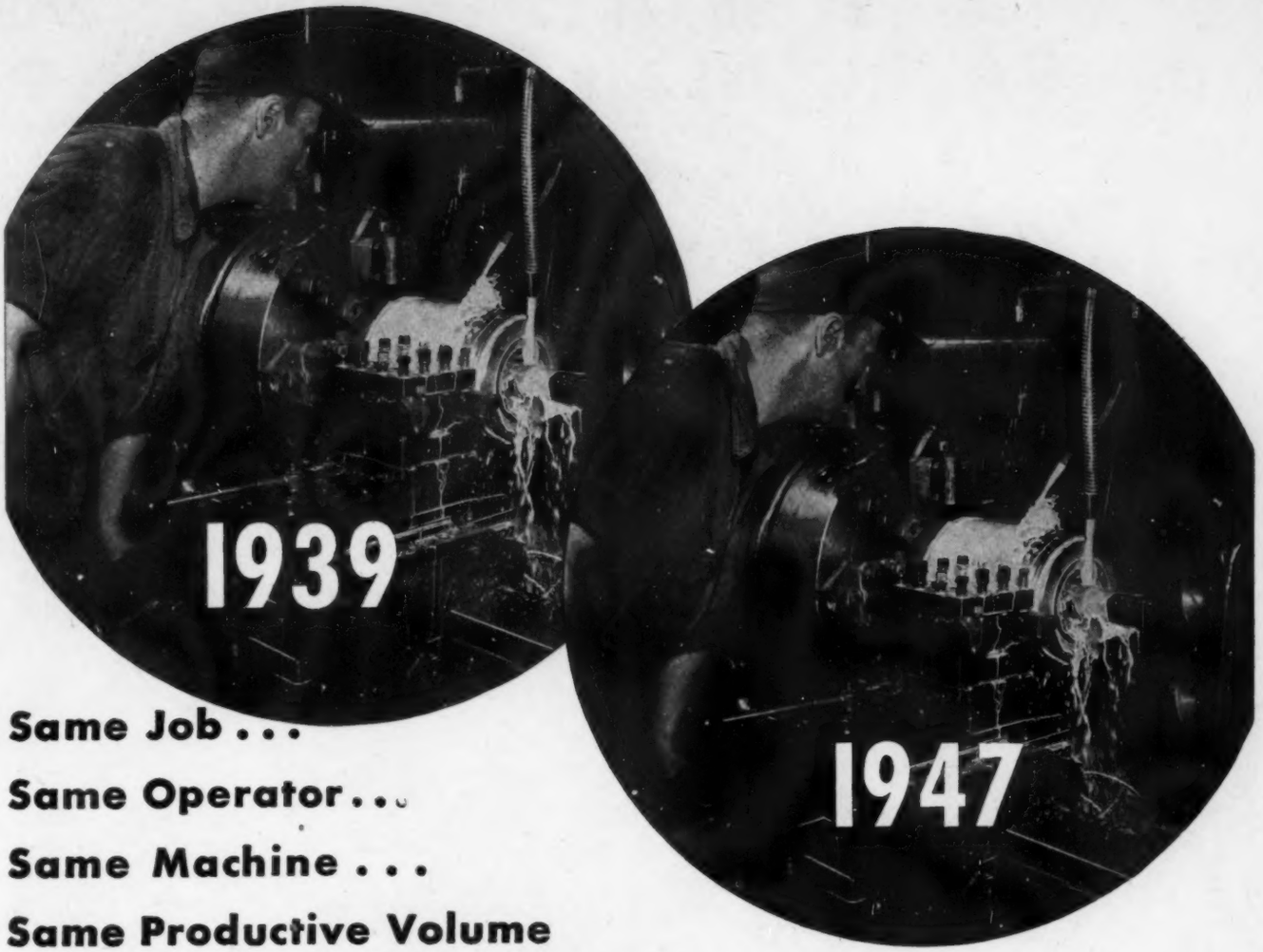
HILL ACME TOOLS FOR INDUSTRY

RECOMMENDATIONS, ESTIMATES AND BULLETINS ON REQUEST

THE HILL ACME COMPANY

6400 BREAKWATER AVENUE • CLEVELAND 2, OHIO

"HILL" HYDRAULIC SURFACE GRINDERS • ALSO MANUFACTURERS OF "ACME" FORGING • THREADING • TAPPING MACHINES
"CANTON" ALLIGATOR SHEARS AND PORTABLE FLOOR CRANES • "CLEVELAND" KNIVES AND SHEAR BLADES



Same Job . . .
Same Operator . . .
Same Machine . . .
Same Productive Volume

but

UNIT COST UP 35%

● Thousands of shops face this picture. After reconversion, they are again producing the same parts in the same volume as in the best prewar year. Operators' skill and machine productivity may be fully up to 1939 records.

But accurate surveys of over 2500 metal working plants disclose that today's cost of materials, overhead, and labor are 35% above 1939.

To make up for these higher costs and to maintain a satisfactory margin of profit without resorting to a steep rise in selling price, present management a serious problem.

If your production processes include turning of metal parts, a Warner & Swasey field engineer may be able to help you. After studying your jobs, he probably can recommend improved machines, new tools and methods, or suggest accessories to be added to your old turret lathes to make them more productive.

1947 MACHINE TOOL SHOW
CHICAGO SEPT 17-26

You can Machine it Better, Faster, for Less...
with a Warner & Swasey

WARNER & SWASEY
Machine Tools
Cleveland

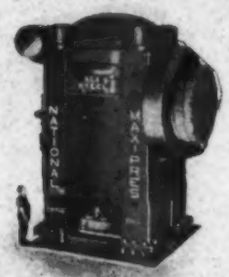
TURRET LATHES, MULTIPLE SPINDLE AUTOMATICS, PRECISION TAPPING & THREADING MACHINES

IMPORTANT

Proper grain flow, high production, minimum scrap loss and reduced machining are important considerations that result in the selection of National High Speed Forging Maxipresses for jobs like this Automotive Ring Gear.

You, too, may benefit by investigating National Forging Equipment and technique.

No obligation!



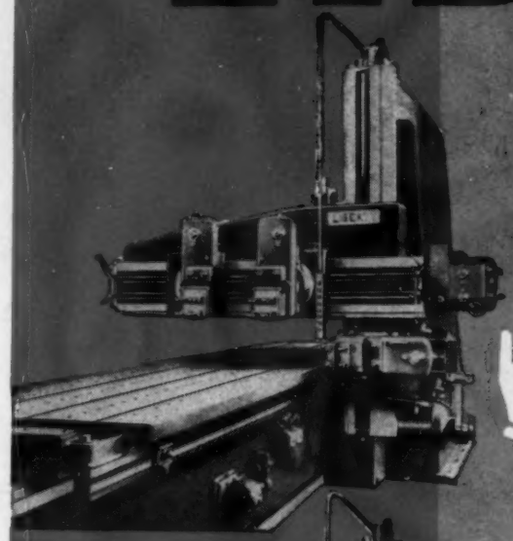
NATIONAL
MACHINERY COMPANY
TIFFIN, OHIO.

DESIGNERS AND BUILDERS OF
MODERN FORGING MACHINES—MAXIPRESSES—COLD HEADERS—AND BOLT, NUT, RIVET AND WIRE NAIL MACHINERY

New York Detroit Chicago

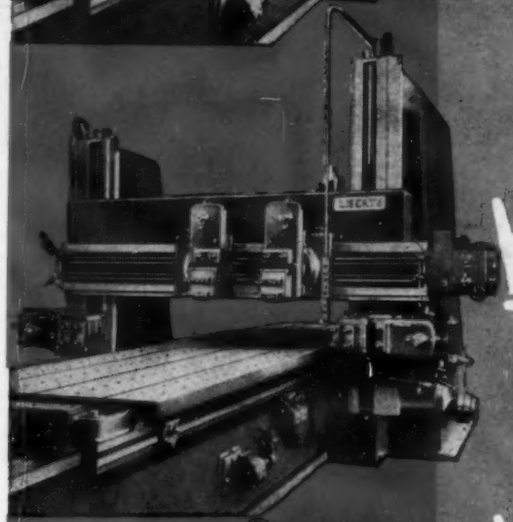
LIBERTY

MAKES ALL THREE



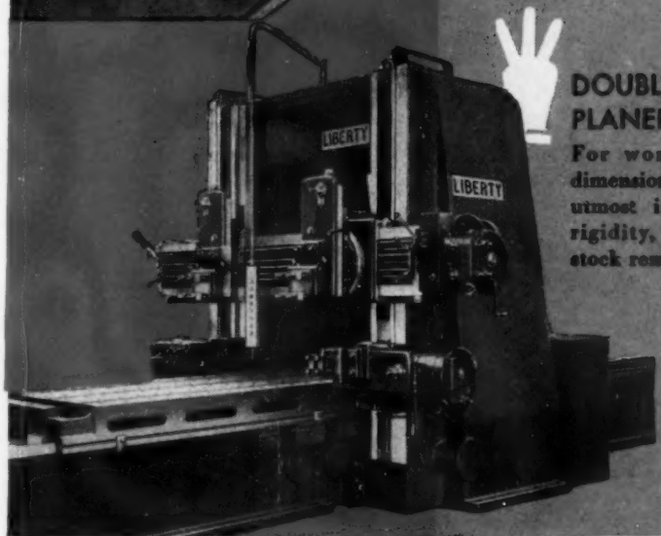
OPEN SIDE PLANERS

For work of variable widths which may extend beyond the normal clearance between housings.



CONVERTIBLE PLANERS

For heavy duty application on accurate, undetermined widths of work where the additional support of a left hand housing is desirable.



DOUBLE HOUSING PLANERS

For work of specific dimensions requiring the utmost in accuracy and rigidity, and maximum stock removal.

Yes, Liberty offers industry fast-operating machines in a full range of sizes capable of planing capacity from 24 inches to 12 feet wide—and even more when required. In addition, special modified designs such as Frog and Switch, widened and raised patterns and other expanded facilities are available to meet your specific needs.

Every Liberty Planer is the culmination of 30 years experience devoted to the engineering, design, production and application of fine planers. The result is equipment of outstanding productivity, accuracy, operating control and safety on which operating speed is limited only by the work or tools you use.

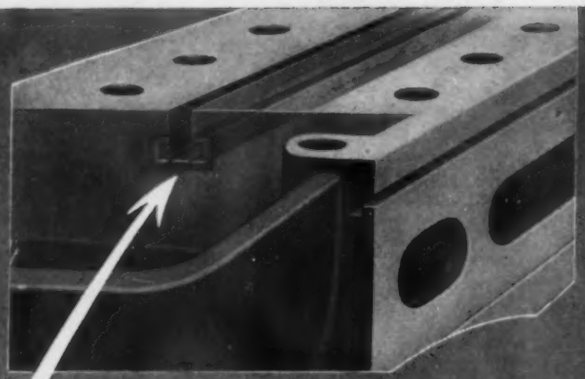
Investigate Liberty! Send for complete information, today!

LIBERTY PLANERS, INC.

HAMILTON, OHIO

GENERAL DISTRIBUTORS: BRYANT MACHINERY & ENGINEERING COMPANY, 400 WEST MADISON STREET, CHICAGO 6

With Exclusive Representatives Throughout the World



Examine your old Planer Tables and then realize the advantages of the patented HYPRO Steel Tee Slot Inserts

- Prevents damage to tee slots by bolt heads
- Prevents pulling out of tee slots
- Insures perfect condition of table thruout life of machine
- Facilitates removal of chips as they will slide freely on the smooth steel not requiring a special tool to remove them
- Can be renewed if necessary

Here's where the wear begins

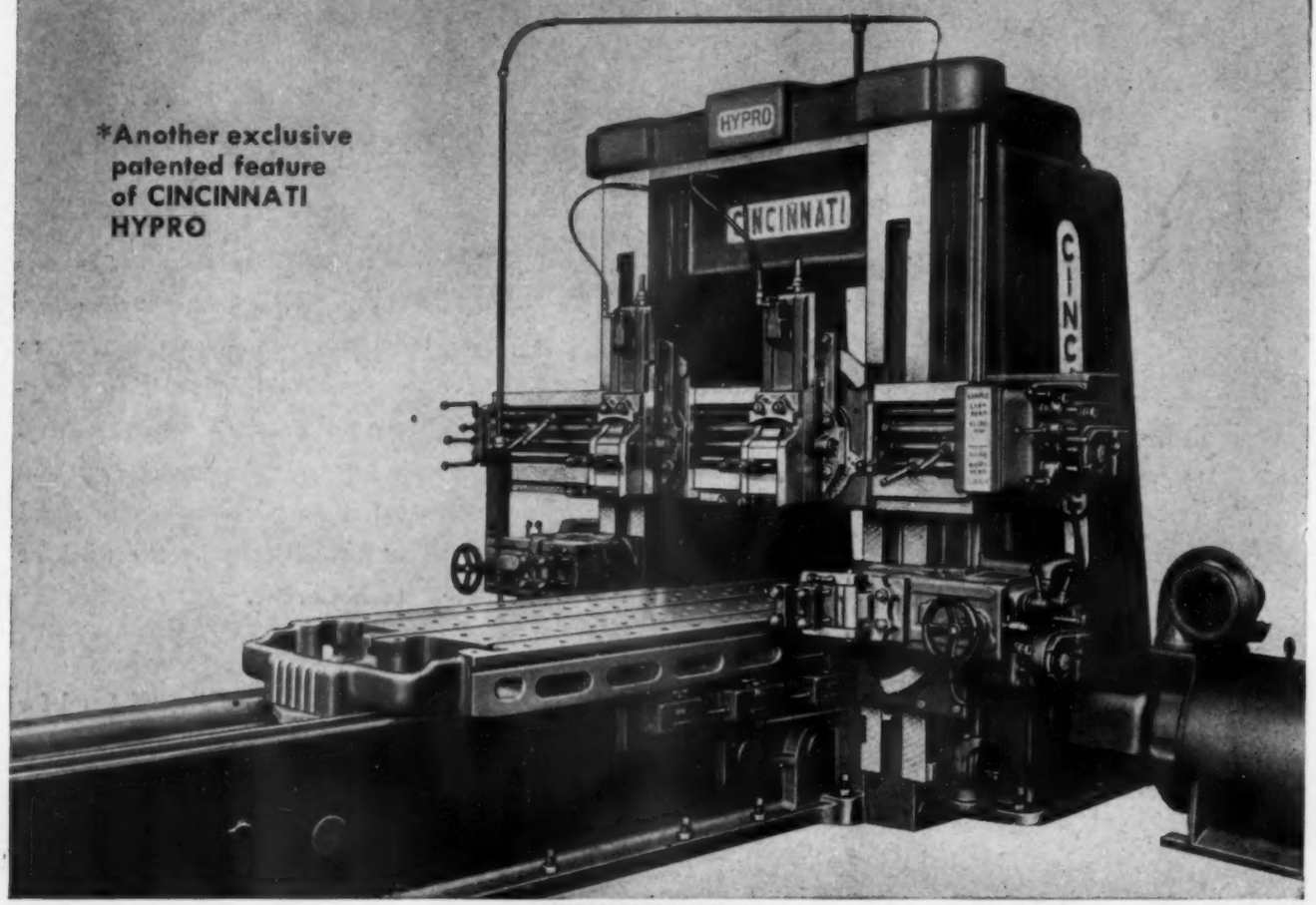
ON AN ORDINARY PLANER TABLE

. . . but not on a CINCINNATI HYPRO

BECAUSE IT IS EQUIPPED WITH

*STEEL TEE SLOT INSERTS

*Another exclusive patented feature of CINCINNATI HYPRO

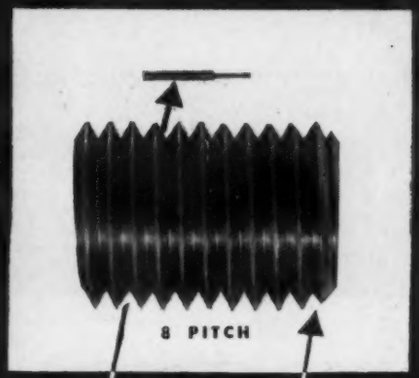


THE CINCINNATI HYPRO PLANER COMPANY

PLANERS · BORING MILLS · PLANER TYPE MILLERS

CINCINNATI, OHIO

Watchmaker Precision* + Production Line Method = VERS-O-TOOL

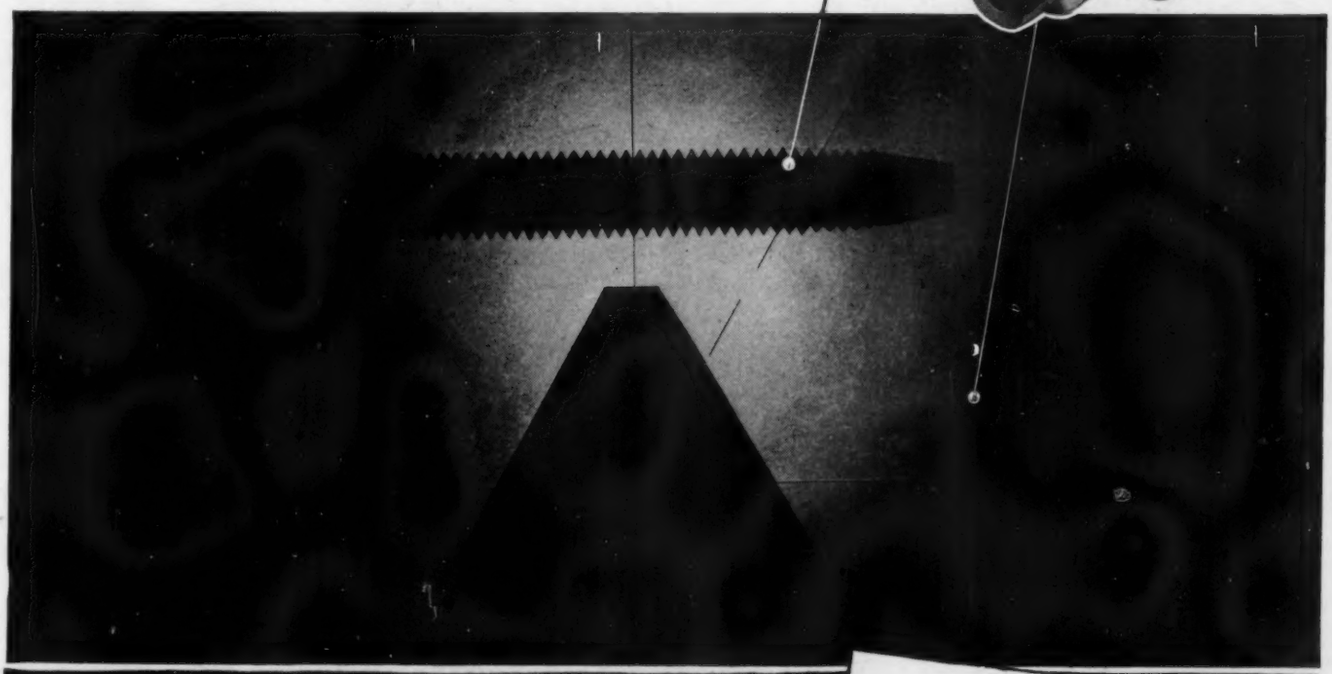


*260 threads per inch on a .038" diameter! Only the Vers-O-Tool can deliver that kind of accuracy on a production job—because the Vers-O-Tool is the *only* ground-thread circular-cutter automatic die head made in such a small size.

In contrast, this same accuracy is available for a *complete* range of diameters; take the 8 pitch 1" diameter screw shown for example.

Regardless of size, when you're threading with a Vers-O-Tool, you'll get fewer rejects, higher production—*and lower costs.* Chasers last longer (they're regrindable through a full 270°). What's more, they're *ground* accurate to begin with—and they regrind accurately (the special micrometer fixture for regrinding takes care of that).

May we give you more complete information? Write for catalog D-42-C.

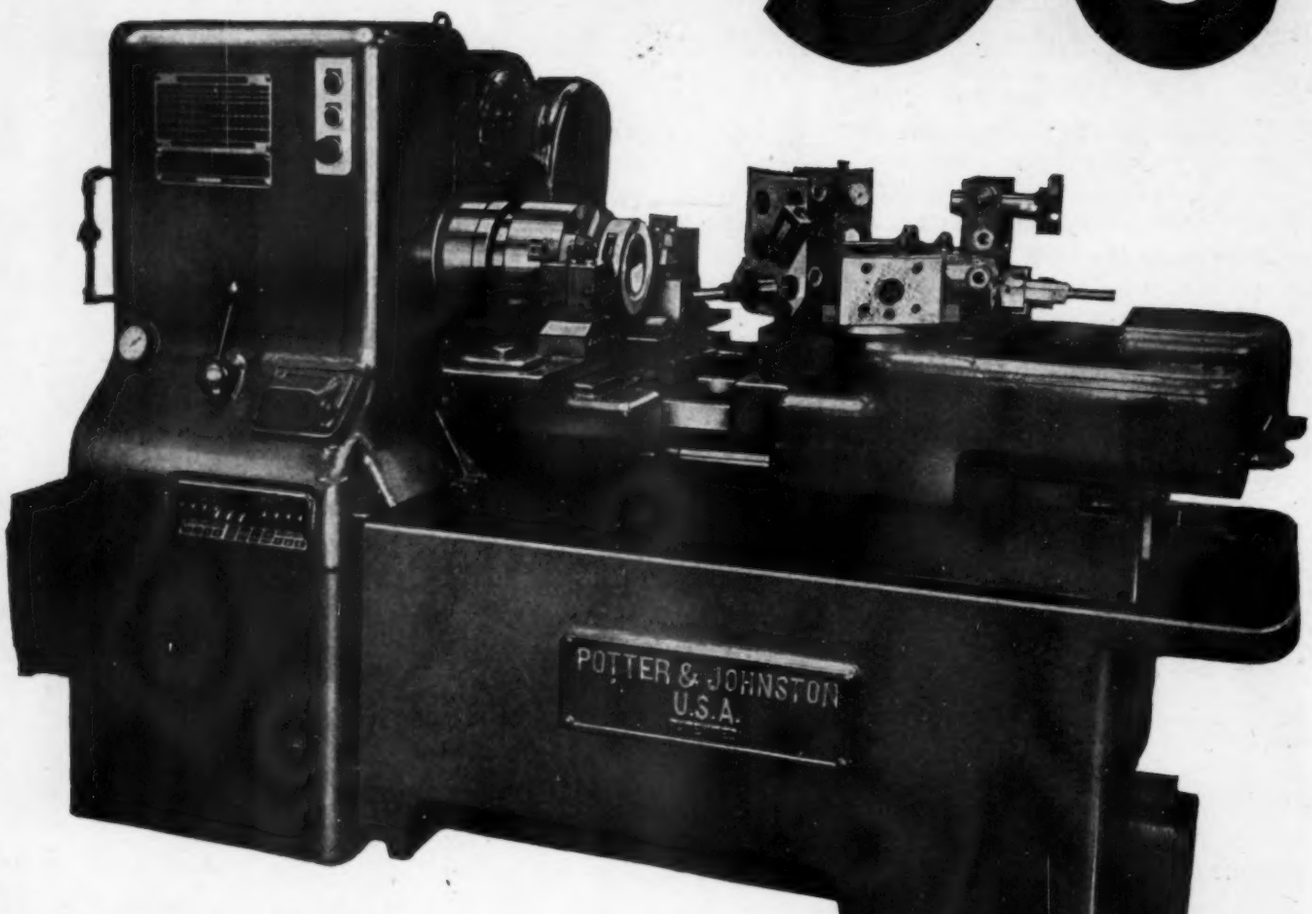


The NATIONAL ACME CO.

170 EAST 131st STREET • CLEVELAND 8, OHIO

SEE THIS EQUIPMENT DEMONSTRATED Booth 628 Machine Tool Show CHICAGO—SEPT. 17-26

THE NEWEST, FASTEST 3U SPEED-FLEX



Below: The new 3U Automatic Turret Lathe, shown in comparison with the 9D, the largest and the smallest in the complete range of P & J Automatic Chucking and Turning Machines.

P&J AUTOMATIC TURRET LATHE

DESIGNED ESPECIALLY FOR HIGH OUTPUT AND LOWEST COST PER OPERATOR ON WORK UP TO 6" DIAMETER, 4" LONG

Now you can get higher output and lower labor costs on jobs which formerly had to be handled on slower, larger machines. The new 3U Automatic Turret Lathe has been especially designed to machine small castings and forgings up to 6" diameter, 4" long. Higher spindle speeds (up to 1445 R.P.M.), rigid construction and ample power enable full use to be made of tungsten carbide tools. Four automatic changes of spindle speed and three automatic changes of feed are accomplished through hand pick-off gears. All speed and feed changes are accomplished by solenoid controlled, air operated, multiple disc clutches. Dogs on the control drum can be set very closely, reducing the non-cutting portion of the cycle to a minimum. Change from rapid traverse to feed, or vice versa, takes but 1/5 second. Rapid traverse of turret-slides and cross-slides for one complete cycle of machine takes but 24 seconds.

Designed by Potter & Johnston—pioneers with over 50 years' experience in building Automatic Chucking and Turning Machines—the new 3U is the smallest and fastest of the present 12 sizes of P & J machines. As a result, it brings new economy, new speed, new efficiency to a wide range of operations. Send us parts or prints, and let us make tooling suggestions and actual time studies that will demonstrate how the 3U Automatic Turret Lathe can bring higher output and lower costs per operator on your type of work.

OUTSTANDING FEATURES

Modern, rigid construction throughout bed, turret and cross-slides, with box type of base.

All high speed shafts and spindle mounted on anti friction bearings. Hardened and ground steel ways for turret slide mounted in base. Hardened and ground steel inserts in turret slide.

All gearing of chrome vanadium steel, heat-treated and shaved.

Standard spindle speed range: 73-1445 R.P.M. Optional dual range: 36-711 and 73-1445 R.P.M. Swing over cross-slide: 8¾". Cross-slide travel each way: 2½". Turret slide travel: 6".

Bijur lubrication of turret slide and bed ways. Cascade oiling of all bearings and gearing in aluminum gear box.

Turret automatically clamped in position after indexing. Combination locking and binding wedge assures accurate alignment with spindle.

Operating air cylinders made of copper ferrite honed to .0002". Piston of hardened steel, Parker Luberized to prevent rusting from water in air line.

Full electric controls. Automatic stop at completion of work cycle. Complete safety features for protection of machine and operator.

POTTER & JOHNSTON MACHINE COMPANY
PAWTUCKET RHODE ISLAND

SCREENS

FOR

JONES & LAMSON OPTICAL COMPARATORS

JONES & LAMSON MACHINE COMPANY
SPRINGFIELD, VERMONT, U. S. A.

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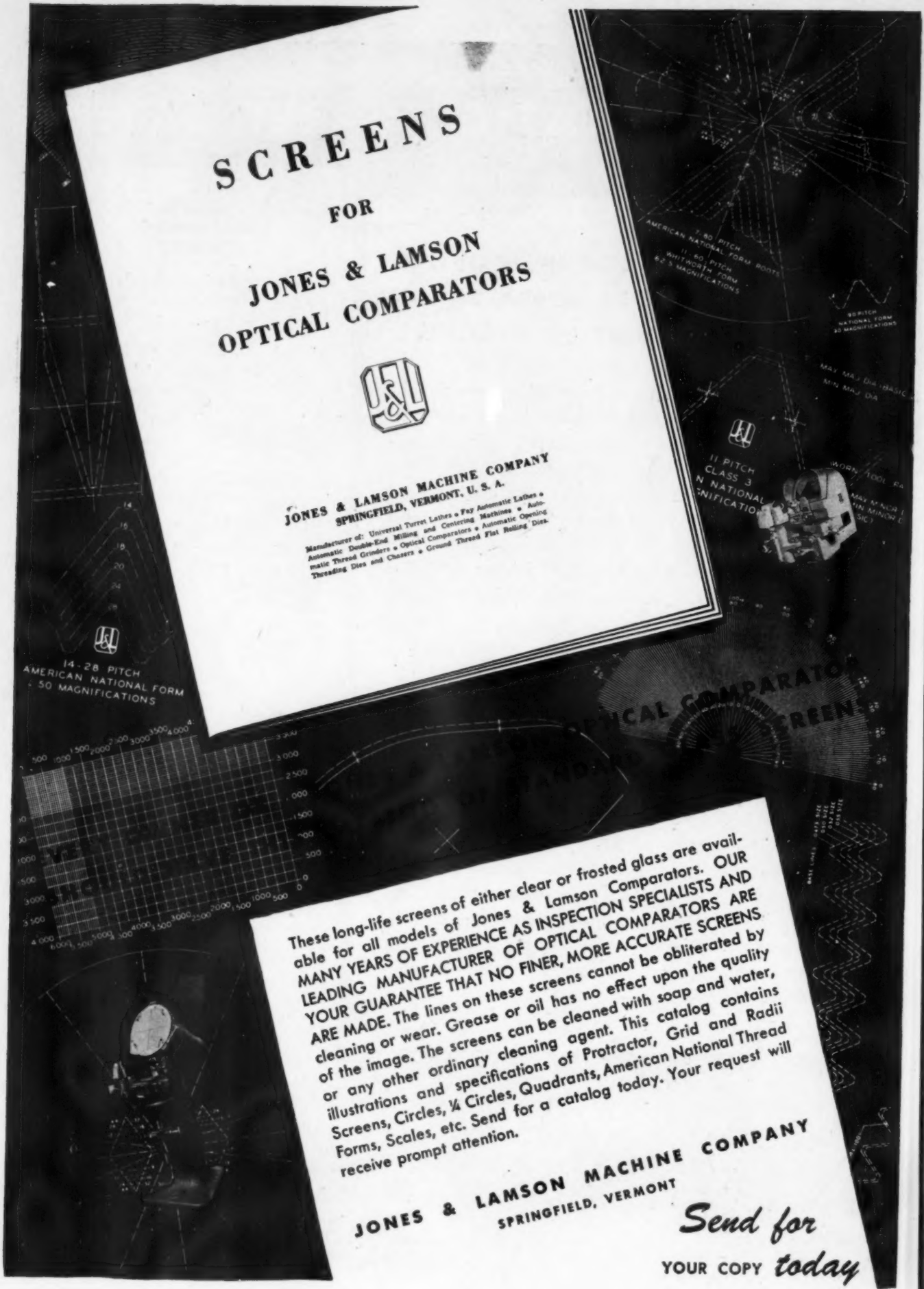

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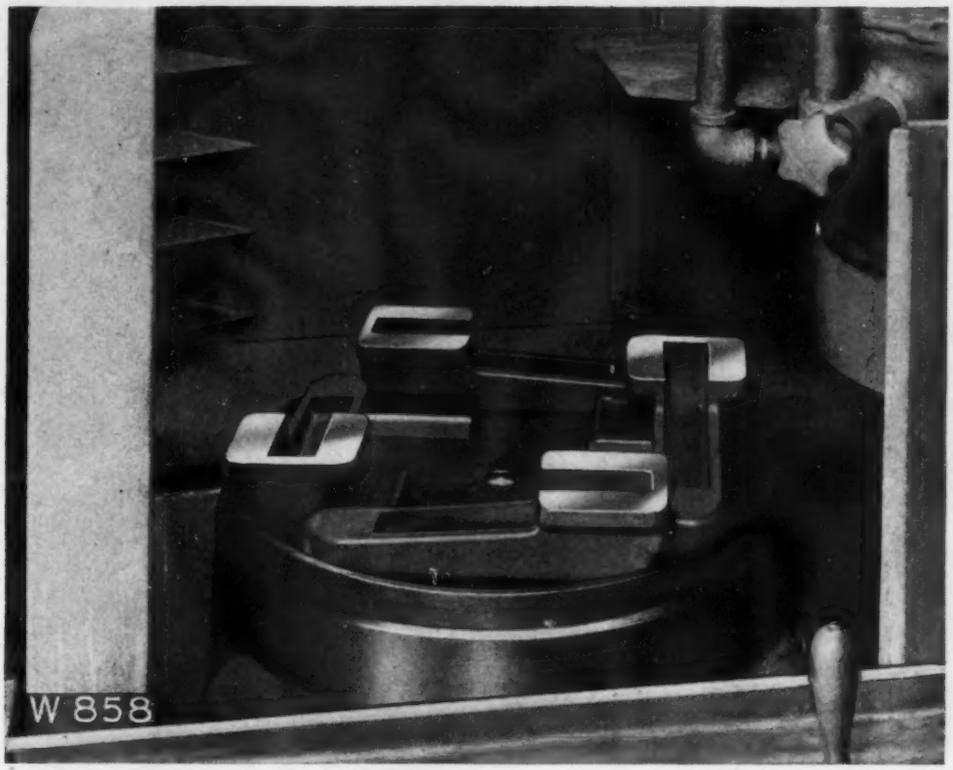
JONES & LAMSON MACHINE COMPANY
SPRINGFIELD, VERMONT

Send for
YOUR COPY *today*

Put it on the Blanchard

Machining a flat surface on lifting brackets



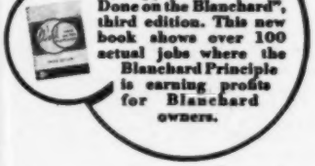
PRODUCTION RATE IS $5\frac{15}{17}$ TO ONE . . .

The very high rate at which a Blanchard removes metal makes it a logical, profitable choice for producing flat surfaces directly from the rough casting. In addition Blanchard Grinders usually provide operation saving, fixture saving, operational ease, safety and give greater flatness with improved surface finish.

Often these add up to amazing savings in time, increased production, and reduced cost-per-piece, as in the case of the above-illustrated cast iron lifting brackets. The *rough* castings—10" x 3¾" x 2½"—are blocked on the 16" diameter magnetic chuck of a No. 11 Blanchard Surface Grinder. One-eighth inch of stock is removed from one surface to produce desired tolerance.

THE PRODUCTION RATE ON THE BLANCHARD IS 17 TIME UNITS PER PIECE AS COMPARED TO 100 TIME UNITS WHEN MACHINED BY THE FORMER METHOD.

It will in no way obligate you to find out what Blanchard Grinding can do in producing flat surfaces on your products. You (or your representative) may see the grinding of samples of your own work at our plant. Your only expense will be for transportation.



Send for your free copy of "Work Done on the Blanchard", third edition. This new book shows over 100 actual jobs where the Blanchard Principle is earning profits for Blanchard owners.

BLANCHARD

The BLANCHARD MACHINE COMPANY

64 STATE STREET, CAMBRIDGE 39, MASS., U. S. A.

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in the Press Room

DANLY PRECISION DOWEL PINS are accurate through their entire length . . . Diamond tested for hardness (58-60 Rockwell-C) . . . Ground to a tolerance of .0001".

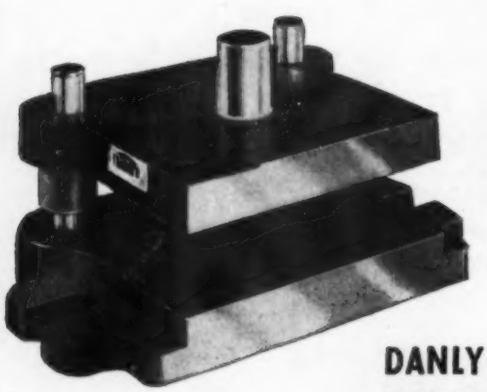
Photo—Courtesy of Croname, Inc.

DANLY KNURLED SOCKET-HEAD CAP SCREWS save time and money. The mechanic can drive the knurled head a good part of the way before using the wrench. Infinite applications—a wide range of sizes.

DANLY KWIK-KLAMP TOGGLE CLAMPS combine strong construction and simplicity of operation—used wherever quick, positive clamping action is required.

DANLY DIE SPRINGS are noted for staying power and high resistance to fatigue. Two complete lines: *Medium Pressure—High Deflection; High Pressure—Medium Deflection.*

DANLY SOCKET-HEAD STRIPPER BOLTS. Made of high-grade steel, these stripper bolts have the same knurled socket-head found in Danly Cap Screws.



DANLY DIE SETS are famed for precision and known accuracy in Die Shops and Stamping Plants everywhere. Many types and sizes in Steel, and Semi-Steel.

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DANLY MACHINE SPECIALTIES, INC.

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Danly Tool, Die and Gage Makers' Supplies

American Machinist's Spot NEWS OF METALWORKING

Regardless of what happens to Preston Tucker, the Machine Tool Show will be held at the Dodge-Chicago plant Sept. 17-26. National Machine Tool Builders' Association has an iron-clad contract with Reconstruction Finance Corporation for the space.

One steel mill is lubricating steel sheet to protect it in rolling and handling by electrostatic method, which leaves only a molecule thickness of film on the surface.

Greater productivity per man is being secured at new plants located in the South than at older plants in the North, according to experience of prominent metalworking manufacturer.

More than 900,000 CIO auto workers are voting in referendum whether to accept merger offer from left-wing Farm Equipment Workers (also CIO) with 75,000 members. Effect of merger would be to strengthen UAW-CIO left-wing faction which Walter Reuther has been fighting.

A so-called "package" of light machine tools to equip a complete small machine shop in countries just starting industrialization is being planned by a group of metalworking people. The complete "shop" would sell for several thousand dollars.

First master contract in San Francisco Bay metalworking industries has been signed by California Metal Trades Association and International Association of Machinists. It grants increases of 13¢-16¢ an hour, plus six paid holidays, to 22,000 machinists in 200 shops. Contract will run two years, with disputes settled by arbitration. New journeyman rate is $1.62 an hour.

Armed services would be permitted to acquire machine tools without charge from other government agencies for strategic reserve under terms of bills HR 3670 and S1198 introduced in House and Senate. If passed, bills make legal the transfer of machines being tagged by JANMAT teams.

Prototype plants for war production are part of the government's industrial mobilization plans. These plants would be models of new production facilities in which small-scale pilot operations would be carried on. Experience gained would be applied to large-scale output in wartime.

Employment in aircraft Big Four—Douglas, Lockheed, North American, Northrup—has dropped to 60,000 from war peak of 350,000. All of Douglas's main plant at Santa Monica, Cal., is being used in making the new 52-passenger DC-6. Lockheed's newest plane is the 92-ton, 180-passenger Constitution, a long-range, cargo-transport built for the Navy. Two of them will be delivered soon. North American is confining work to military aircraft, Northrup is concentrating on the Flying Wing.

Buick and Pontiac will have automatic transmissions in '49 models. They are likely to be called "torque-matic" drive. Buick will make its own units, Pontiac's probably will be built by General Motors' Detroit Transmission Division.

Manufacturer has reduced time for making a certain metal product from 5-8 hours to ¾ hour by offering men five-hours' pay for each unit assembled. Big cost-saving is the result, production has been doubled and quality is just as high as formerly. Plan has been working four months.

Thirty percent of new electric power sales made the past year by one large utility company has been in application of power to machinery for reducing labor and increasing output.

Inclusion of "no-strike" clauses in union contracts is advocated by H. W. Story, Allis-Chalmers Mfg. Co., speaking at annual meeting of MAPI. Almost all other clauses consist of some sort of concession to union. Management should get "no-strike" agreement in return for such concessions.

On jobs like this, you'll get longer hob life with *Texaco Cleartex Cutting Oil B*. This fine, transparent oil saves work inspection time, does not corrode or discolor metal, can be re-used without loss of effectiveness.

WAYS TO SAVE ON EVERY CUTTING JOB

IN *Texaco Cutting, Soluble and Grinding Oils* you have a complete line of cutting coolants to assure better, faster machining of all metals — at appreciable savings.

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3. SAVE ON FINISHING OPERATIONS. Better finish on the original cut frequently eliminates one or more additional operations.

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Let Texaco Lubrication Engineering Service help you improve your machining and reduce your costs. Just call the nearest of the more than 2500 Texaco distributing plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.

TEXACO

TEXACO CUTTING, SOLUBLE AND GRINDING OILS FOR FASTER MACHINING

Tune in . . . TEXACO STAR THEATRE presents the NEW TONY MARTIN SHOW every Sunday night. See newspaper for time and station.

American Machinist

MAGAZINE OF METALWORKING PRODUCTION ★ ESTABLISHED 1877

New Era in Labor

Any employer who reads carefully the new labor law will not toss his hat high in the air.

The National Association of Manufacturers certainly didn't write it! It has numerous pitfalls for management.

For one thing, it sets up a "general counsel" of the National Labor Relations Board who is, in effect, a labor czar. He possesses almost unlimited power, acting in the name of the Board, but independent of it.

He has final authority to investigate charges and issue complaints. The Board acts at his pleasure.

Beyond that, the act authorizes the Board to go on "fishing expeditions" for information and grants it the power to subpoena. What is to prevent a subpoena being issued to a company officer to bring in his books and reveal their contents?

Every employer will tell you that plant elections are a pain in the neck. They engender confusion and friction. Efficiency suffers during the preelection campaign. Yet under the new law there will be more elections than before.

A separate election must be conducted on each of the following issues: (1) What is the bargaining unit to be? (2) Do you want a union as your bargaining agent? (3) If you have a union, do you favor "union security"?

The act has many phrases the meaning of which will have to be decided by the courts. Who is a "professional employee"? What constitutes "coercion" of employees?

With all its defects and weaknesses, however, the "Labor Management Relations Act, 1947" grants to employers certain rights and denies to unions certain objectionable practices which tend to restore a balance long missing in industrial relations.

More than that, the act outlaws practices inimical to the public interest. Unions no longer are the fair-haired boys free to indulge without fear of punishment in any tricks which they may conjure up at their pleasure.

Now there are three interests to consider—the employee's, the employer's and the public's. The public began to count, we might add, on November 6, 1946.

No longer can "no contract-no work" be the signal for John Lewis or any other union official to call a strike. It now is illegal.

No longer can organized slowdowns be staged. They are outlawed.

No longer can a plant election be won on the basis of a majority of those voting unless they likewise are a majority of those eligible to vote.

We could go on and on. But space limits us to this much more—supervisors cannot belong to employees' unions, featherbedding is forbidden, secondary strikes and boycotts are banned, unions are compelled to reveal their finances and operational procedure, rules of evidence applicable in the courts are to be used in Labor Board hearings.

If these obligations imposed upon unions add up to slavery, as some officials have charged, the word slavery has a new connotation not in Webster.

We believe that they add up to a square deal for employer and employee.

Burnham Finney

EDITOR

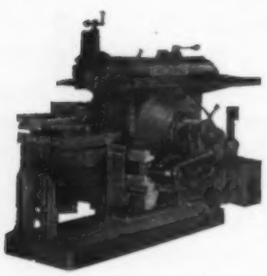
Shape - Form - Shear

...ON A "CINCINNATI"

Today Cincinnati Shapers are more efficient than ever before with heavier cutting capacities and speeds up to 200 strokes a minute on the 16"; and with a degree of *accuracy* that has never been excelled. Their power rapid traverse; multiple cam feeds; direct reading dials; and automatic oiling sell discriminating buyers. Coupled with these mechanical features are convenient controls; simplified adjustments; and means for quick and easy set-up, all of which please the operator.

Cincinnati Shapers are built in regular or universal type from 16" to 36". Ask for Cat. N-3.

See these machines under power at the Show



Cincinnati Press Brakes, the brakes of many uses, are today's machines for bending, forming, flanging, or multiple punching sheet metal. For easy fabrication, formed parts must fit; therefore *accuracy* is a fundamental advantage of these Brakes. Full-rated capacities; all-steel construction; built to withstand overload; deep bed and ram to avoid deflection are a few of the high points. These Brakes are built as accurately as a machine tool, and have unusual mechanical refinements.

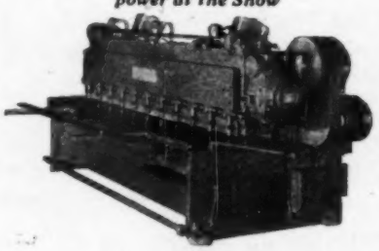
Sizes to cover practically any requirement. Ask for Cat. B-2

See these machines under power at the Show

Cincinnati All-Steel Shears offer a new degree of *accuracy* in shearing sheet metal. They cut to tolerances that take a micrometer to measure; and shear with this *accuracy* at high speed. They shear a wide variety of material in both ferrous and non-ferrous metals. Hydraulic holddowns automatically clamp any gauge of metal with the same firm pressure; fine adjustments for the four-edge knives give more efficient use of the keen edge and longer life. Rapid, accurate gauging speeds up handling of the job.

Standard capacities of Shears range from 10 gauge to 1¼ inches. Ask for Cat. S-4.

See these machines under power at the Show



THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO U.S.A.

SHAPERS · SHEARS · BRAKES

See these machines in action at the **Machine Tool Show** Chicago, Sept. 17-26. **Booth No. 417**

Some 13 acres within the buildings of the tremendous Dodge-Chicago plant will be occupied by the Show

Industrial Revolution on Display

MACHINE TOOLS, created from the crisis of the past decade, can help solve the grave problems of our current industrial and economic revolution. Hundreds of new ones will be shown in Chicago

BY A. G. BRYANT

FIRST VICE-PRESIDENT, NATIONAL MACHINE TOOL BUILDERS' ASSOCIATION
VICE-PRESIDENT, CLEEREMAN MACHINE TOOL COMPANY
PRESIDENT, BRYANT MACHINERY & ENGINEERING COMPANY

JUST as the atom bomb has, with its terrifying implications, revolutionized our thinking about international relations, so also, have startling technological developments revolutionized our industrial outlook.

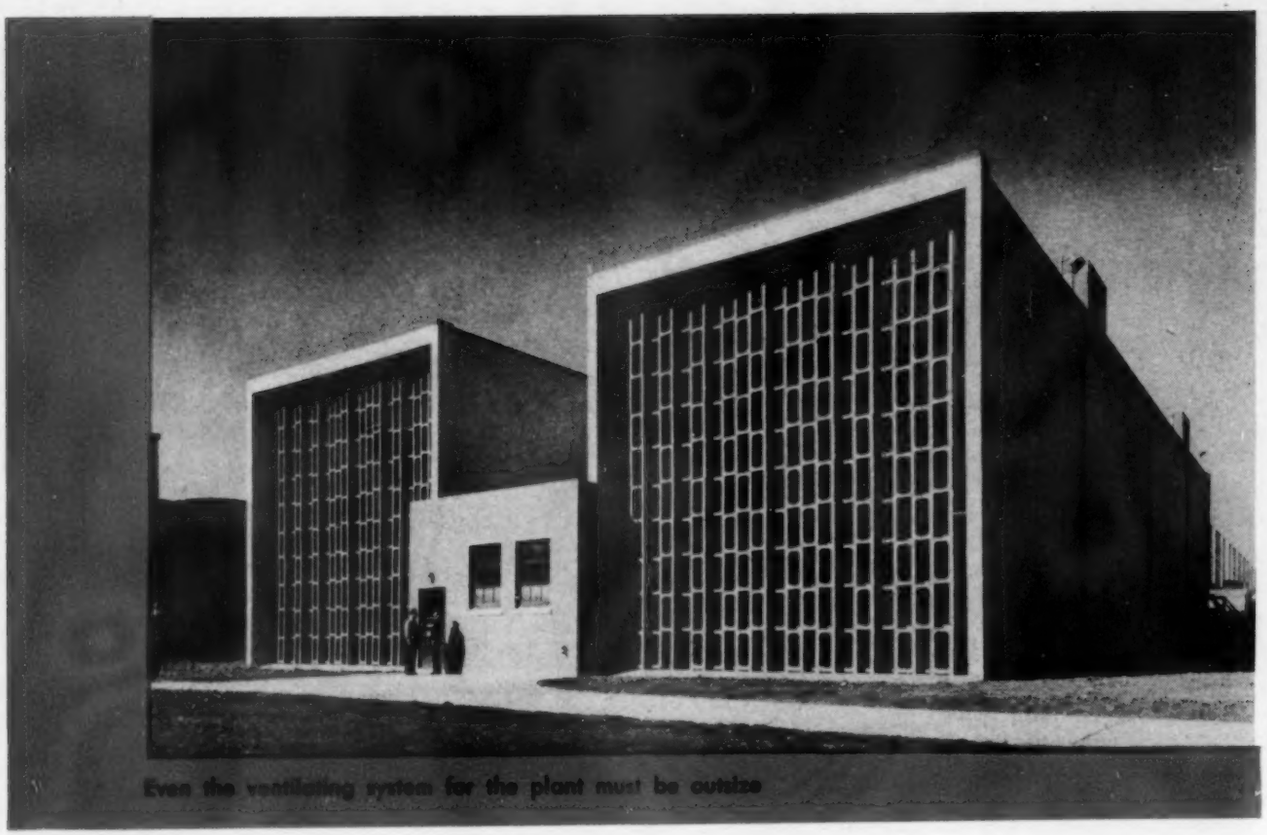
This industrial revolution is difficult to assay because so much of the important progress in manufacturing has transpired within a generation. We have scarcely caught our breath in absorbing the techniques of the 20's and 30's, so the shock of these changes of the 40's leave us gasping.

It is not so very long since we were introduced to modern industrial life by the introduction of the principle of interchangeability of parts which made mass production possible. With mass production came a great advance in the standard of living caused by the manufacture of automobiles, refrigerators, radios, etc., at costs which brought them within the reach of the average family.

Over twenty years ago, there came a tremendous development in machine tools caused by the application of tungsten carbide to machining operations. This, with the impetus in development of electric drives, hydraulics and other improvements, made the pre-World War I machine tool obsolete. The tremendous industrial progress of the decade of the 20's was largely a result of the revolutionary effect of the enormously increased productive capacity of the new machine tools on the manufactured products of that era.

Now we have experienced since 1939 an intensification of engineering and scientific effort in the development of higher production never

A SPECIAL American Machinist PRE-SHOW REPORT



Even the ventilating system for the plant must be outsize

INDUSTRIAL REVOLUTION ON DISPLAY continued

dreamed of previously. For six years, science, governments, engineering professions, industry and labor concentrated on devising ways of increasing production to satisfy the insatiable appetite of war. New techniques have matched new demands. New machines have overcome new problems. Many of the machine tools applied to the manufacture of war materiel have demonstrated how peacetime goods can be better produced.

At the same time the traditional ingenuity of machine-tool builders has been stimulated in creating new designs of machine tools so the pent-up demand for countless devices further to raise our standard of living may be satisfied at cost levels within reach of the average man.

The impact of this great concentration of engineering research upon industrial methods will at its peak be revolutionary. Concerns that are resting content with machines and processes conceived before the war will awaken with a shock to operating losses. Companies which are quick to avail themselves of the new designs of machine tools and to their new market potentials because of improved techniques and lowered costs will ride the tide to success.

● Advances Dramatized

It is fitting that such an outburst of revolutionary design should be dramatized this year in the great Machine Tool Show to be held Sept. 17 to 26 in Chicago.

The machine-tool industry has for many years pursued a conservative policy in announcing and demonstrating its latest designs. The National Machine Tool Builders' Association in the late 20's inaugurated a policy of holding its own machine-tool exposition at intervals of every four or five years. Depression and war have interfered with this schedule, the last great show having been held in Cleveland in 1935. In 1939 an exposition was scheduled, but cancelled because of the sudden impact of war in Europe.

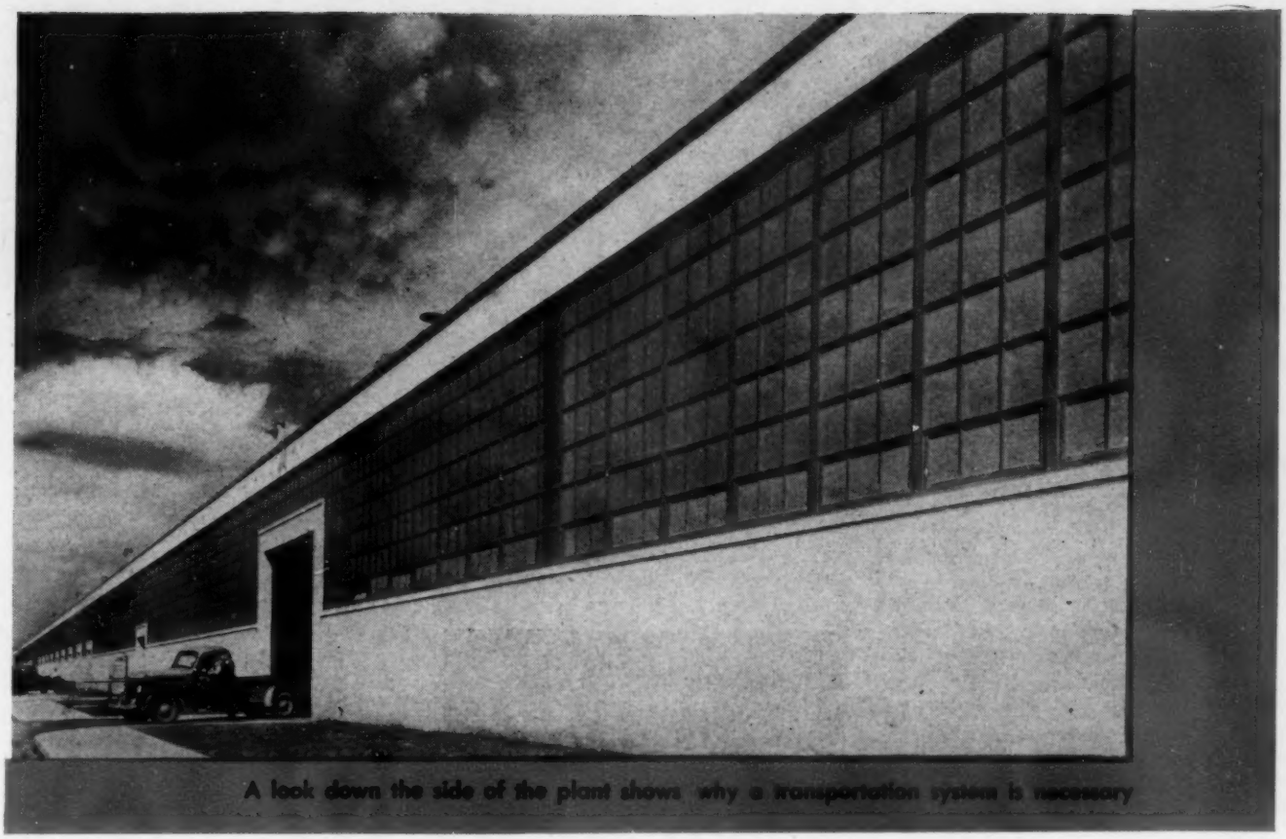
Now, twelve years since the exposition of 1935, the machine-tool industry will exhibit its finest. It will probably be another several years before such a demonstration is again attempted. Many a young engineer or shop executive is too young to have visited the machine-tool show in Cleveland in 1935. Certainly it will be years before anyone again sees an exposition on the scale of that scheduled for September, 1947.

In physical area the Exposition will be titanic. The 513,000 sq. ft. occupied by this show is more than twice the gross area used in Cleveland in 1935. More than 250 leading manufacturers will exhibit more than 1000 new machine tools, forging machines and other metalworking machinery.

No regular exhibit hall in America has adequate capacity for such an exposition and it is appropriate that the show will be held in part of the great 94-acre Dodge-Chicago Plant, world famous for its production of engines for the B-29 bomber and enabling the machine-tool industry to demonstrate under conditions simulating actual modern production.

● VJ Plus Two Years

Held two years after VJ Day, the timing of the show has given the Industry time to translate its war-born ideas into designs intended to revolutionize peacetime industrial production. With the world crying for goods and with the economic system under strain, the greatest contribution that can be made to peace, happiness and the comfort of millions of people is in a greater economy of production, resulting in a stimulation of employment and a brake upon inflation.



A look down the side of the plant shows why a transportation system is necessary

The importance of this show to society transcends its effect upon the welfare of the machine-tool industry. It will be a great demonstration of a practical means for satisfying the economic requirements of this postwar era by assuring continued high levels of employment and by reducing inflated living costs.

Every basic type of machine tool will be demonstrated under power; from great planers to the smallest bench-type drilling machines, every classification of power-driven metal-cutting machines will be exhibited. Every machine tool, of course, will be the latest and finest of its class produced by its manufacturer.

Designs which were under preliminary development even when the war struck and which were laid aside by machine-tool builders until the emergency ended have now been completed and translated into the actual machines. Aided by the techniques developed in the streess of war production, machine tool designing genius has created equipment greatly surpassing in precision, in range and in capacity machines which a decade ago were considered the ultimate.

The Machine Tool Show also will physically demonstrate the highly competitive nature of the industry and the great variety in size of the manufacturers. Truly, the machine-tool industry is an aggregation of industries. Groups of lathe or drilling-machine or milling-machine builders are composed of competitive manufacturers. There is great variation, of course, in the volume produced by these various groups. For example, there is a much greater dollar volume of business done by the milling-machine manufacturers as a group than by the upright drilling-machine builders. Naturally, therefore, the individual companies are in most cases larger than the typical drilling-machine builder. The size of exhibit space and the variety of types and sizes of machines reflect this difference.

Small and Large Together

It is an interesting fact, however, that although one type of machine tool may may be used in greater quantities than another, the lesser one in volume is nevertheless basically essential to industry and is, therefore, indispensable. Accordingly, we have in the machine-tool industry an exhilarating example of American democracy wherein small manufacturers exhibit their products alongside the displays of larger companies in full confidence that although they are, through the nature of their product, lesser in size, they are, nevertheless, just as vital in making the wheels of American industry go around. A more typical demonstration of the ingenuity, the resourcefulness and the competitiveness which has been responsible for making American industry supreme than this exhibit of the machine-tool industry can scarcely be conceived.

Credit Machine Tools

Can we foresee the revolutionary effect of the application of these latest machine tools to the production of goods? The answer probably is best given in an understanding of the startling effect of the machine tools of the past generation upon our present scale of living.

For example, if we today relied upon the methods available for the manufacture of automobiles when they were first invented, none but the very wealthy could afford the $25,000 to $50,000 price of a hand-made auto. The average family is able to use the automobile today simply because machine tools organized for mass production made the cost so much lower that they became an economic necessity instead of an extravagance.

When Sholes invented the type-

writer in 1867 it was relatively inefficient and at the same time enormously expensive because it had to be built literally piece by piece using the best tools available at the time. When, later, improved machine tools made it possible to mass-produce the typewriter it became an accurate, dependable and workable device and its cost was so reduced that no business firm could afford to operate without it.

Milton S. Eisenhower, an educator with a broad grasp of sound political economy, called attention recently in an article in "Collier's" to the astounding fact that we inhabitants of the globe must sustain ourselves with the produce obtained from just two acres of ground for each and every man, woman and child living. His plea for soil conservation to prevent the under-nourishment of millions should be supplemented with a recognition that only by more efficient mechanical appliances can the farmers of the world produce sufficient food at a sufficiently low cost to feed the population. Millions of people are hungry today not only because of devastated lands but because in large areas of the world we are not adding mechanical aid to manual effort to obtain greater production at lower cost.

● Machines for Living

Without the farm-equipment plants producing with machine tools the reapers, the plows, the tractors, the cultivators and the milking machinery used increasingly by the American farmer, we certainly could not raise the produce that our land is supplying today. If we do not produce this farm machinery economically so it is within the budget of the average farmer, our present high prices of foodstuffs will be even more inflated. In fact our principal hope of lowering food prices and of thus combatting inflation is by the application of more efficient and more economical farm equipment to supplement the expensive efforts of manual labor.

If the machine tools presented to the public at the great exposition in Chicago in September can replace a large share of the now outmoded machinery of the pre-war era, the increase in output efficiency will be a great boon to society. Think what an increased efficiency of from 25% to 50% would mean in increased output of goods which are in dire need, and think of the effect upon consumers everywhere of the influence of this increased efficiency upon reducing prices.

Truly, the Machine Tool Show will point the way towards revolutionary production methods and resulting revolutionary changes in our economic life. It is the people who use automobiles, sewing machines, typewriters, tractors and washing machines who have received the real benefit from the use of machine tools in the economical production of all these items. Likewise it is the people of the world who will benefit from the application of these newest designs of machine tools which are the outgrowth of a tremendous concentration during the war upon research and engineering directed to the improvement of the master tools of industry.

We are longing these days for changes of a kind that will help to stabilize conditions and will aid in solving the fundamental problems of great shortages and maladjustments in costs and prices. A practical, effective and immediately available instrument in helping to solve these problems lies in the utilization of products of the machine-tool industry.

TIPS for Top Shop Men

189 Don't go off half-cocked. Idea, suggestion, bawling-out or compliment—be sure your facts and plans are straight before you broach them.

190 Be sure you understand instructions before you start a job—and be just as sure your men have your instructions straight before they start. Some men "catch on" quickly; others take more time—you'll have to suit the explanation to the man.

191 Keep your eyes open for new methods adaptable to jobs in your plant. There are few new ideas, but the new adaptations of old ideas spell the difference between low and impossible production costs.

192 Men have twice as many hands as heads, but the head is worth far more than twice the hands. Use their heads—and save their hands. That'll save them fatigue, you effort, the company costs—and make more for everybody concerned.

193 It's worth more money to salvage a man than to salvage other materials. If a man was worth hiring, he's worth the effort to save. Firing is the easiest, but not the best, way out.

● Industrial Revolution

"Industrial Revolution on Display?" That is what the Machine Tool Show in Chicago in September will represent. If public policy and broad-gage industrial and financial leadership will grasp the opportunity, it will consider the substitution of these more modern machine tools for the obsolete machines of the past, not as "overexpansion," not as a burden upon invested capital, but as a means for increasing sales, for acquiring production, for lowering costs, for reducing prices and for increasing employment.

The course of all industrial history has demonstrated that only through improved mechanization can employment increase and can working conditions of labor be improved.

The National Machine Tool Builders' Association, mindful of its responsibility to bring to the American people a demonstration of the genius which provided the core of our war production, and which must be the backbone of our future economic life, has made a herculean effort to plan a show that may indeed provide a turning point in our industrial outlook.

The machine-tool industry, after twelve years, now again puts its finest on display. Attendance by industrial executives, financiers, educators and leaders of labor is a challenge because of the importance of the show to society at large. It will give an indication to the public of what may readily be done by harnessing for the general welfare these phenomenal machine tools created in the heat of the industrial revolution through which we are passing.

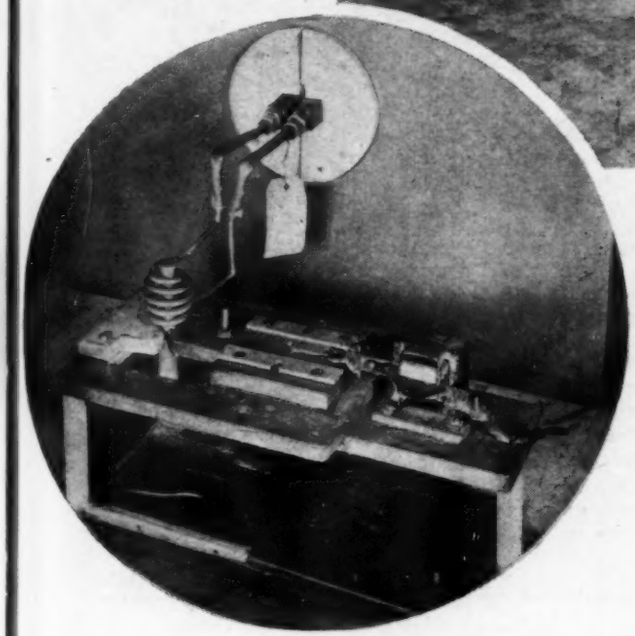
The Machine Tool Show will give the public an indication of how the new machine tools, created out of the crisis of the past decade, can help solve the grave problems of the industrial and economic revolution through which we are passing.

BY

L. J. SHEEHAN

Materials Engineer

JONES & LAMSON MACHINE CO.



INDUCTION UNIT . . . A Model 1070 Thermonic induction generator (left, large photo), rated 205/245 volts, 60 cycles, single-phase, full-load input approx. 37 kva. at 90% P.F. Full-load output is 1070 Btu./min., about 20 kw. at 375,000 cycles. This unit serves a 2-position worktable (right) with 2- and 4-turn r.f. transformers, 4-station vernier set timer, two motorized rotating spindles, 2-station water-quench outlets and sink. It also serves a single-position, 2-turn transformer output station (center) complete with drop-quench equipment (closeup). The latter is an adjustable, solenoid-operated V-jaw vise of transite, controlled by the set timer to drop work when proper temperature is attained. A wide variety of small parts can be handled. Shown is a pin in which hardness is localized to the center, leaving head and opposite end with crosshole soft to eliminate cracking in service at these points. Two quench tanks are provided, a brine tank with agitator (right) and an oil tank with 1½-in. wood baffle frame to permit slower cooling

Induction Hardens Tricky Machine-Tool Parts

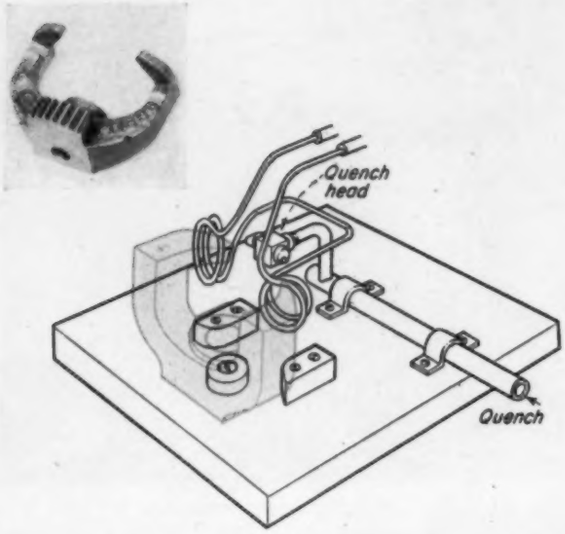
Initial applications at Jones & Lamson result in rerouting of more than 175 standard jobs, plus solutions of special problems

TWO YEARS ago, Jones & Lamson Machine Co., Springfield, Vt., installed an induction-heating unit, providing 1070 Btu. per min. (20 kw. at 375,000 cycles) to a 2-position work table with water-quench outlets and a single-position station equipped for drop or immersion quenching. Equipment has since been used for multi-purpose heat-treating and brazing operations on a variety of applications. More than 175 standard jobs have been permanently rerouted for operations on this unit. Also, many 1- or 2-piece special parts have been routed for induction-heating operations. Most of these jobs were extremely difficult to handle by any other methods.

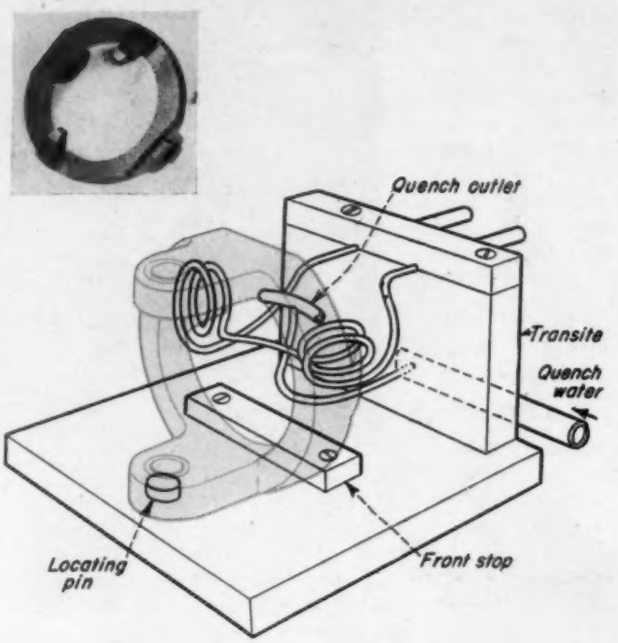
All parts formerly heat-treated in a lead pot have now been rerouted to the induction unit. This made available a controllable furnace, with indicating controller, for other uses, and eliminated a 20-year-old furnace which has been difficult to maintain at sufficiently uniform temperature. Also two salt baths formerly constantly overloaded have been relieved by transferring jobs.

Typical of the quality improvement by greater localization of heat, and subsequent savings resulting from elimination and/or reduction in time or number of operations, are the jobs sketched, each showing the home-made fixture on which it is done. A feature of these fixtures is the use of anything available for quenching heads, one of the most successful being the plastic or aluminum (former preferred because it is non-metallic, hence absorbs no heat and can be placed close to the coil) spray heads for soda bottles,

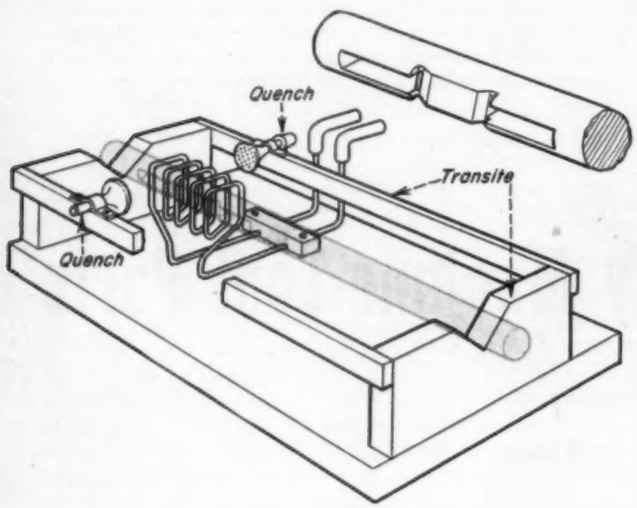
INDUCTION HEATING FIXTURES AT J&L



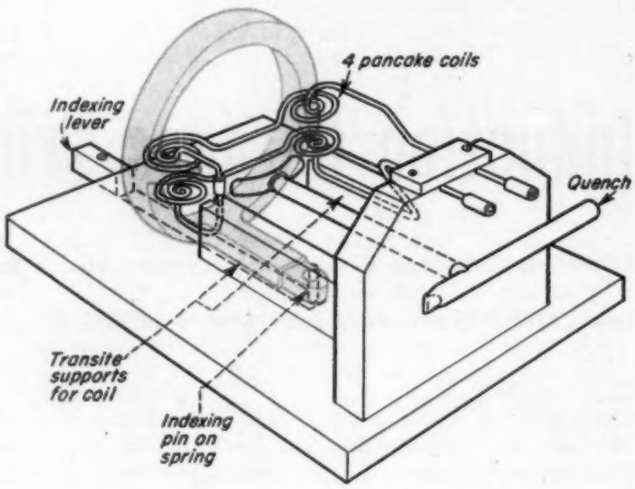
HARDENED IN TWO SECONDS . . . This yoke, of steel, requires hardening of the ears only. The yoke is located by a pin entering the base hole, which places the ears within 2-turn coils. Quench is provided in this case through a conventional lubrication-system tee with the cross outlets cut at 45° to direct the spray. Heating time is 1.2 sec.



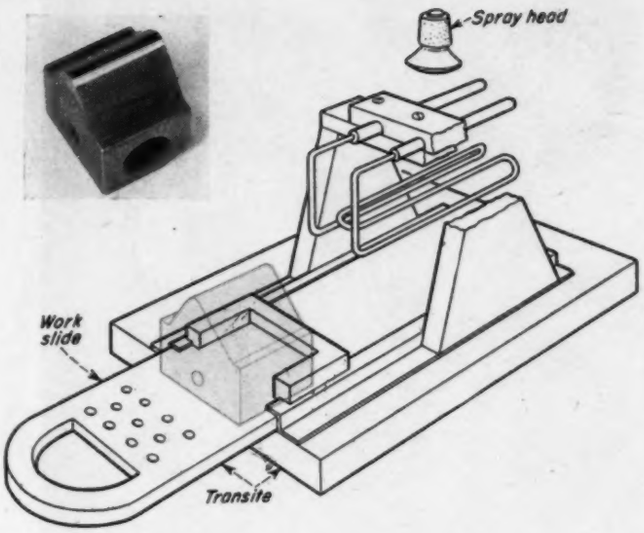
TIME CUT 97% . . . The single-lever speed-control yoke for the J. & L. Universal turret lathe was formerly made of an SAE 4615 casting. It required special handling to minimize distortion during carburizing in a salt bath, requiring 7 min. per piece in lots of 50. It was then hardened in a lead pot, requiring 6 min. per piece. For induction heating, material was changed to a direct-hardening material to eliminate carburizing and frequent correction for distortion. Material is now slightly higher in cost, but time has been cut from 13 min. to 20 sec. per piece, floor to floor, thereby showing considerable savings



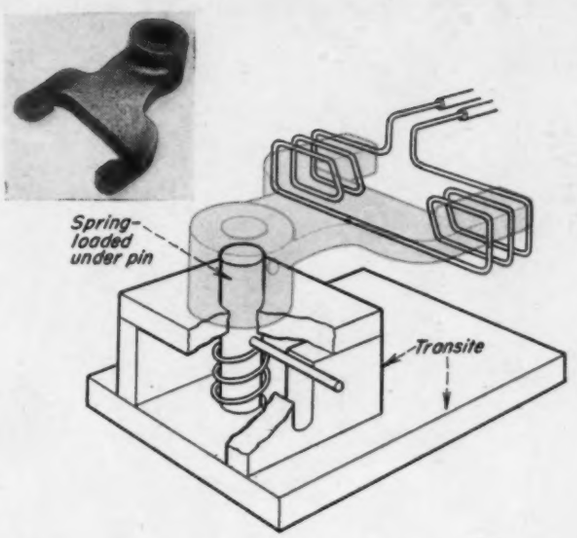
TIME CUT IN HALF . . . Thread-grinder and turret plungers were originally hardened in a neutral salt bath to include the flats, then annealed in the lead pot on the end, to leave only the flats hard. It was faster to harden flats between air-gas torches. This, however, depended upon the operator to prevent flame impingement sufficient to cause pitting on flats or hardening of thin sections. The latter increased loss from breakage during subsequent straightening. This fixture permitted induction hardening with a uniform heat pattern and immediate controlled quenching from sprays. Hardened area is localized, correcting carburizing distortion so scrap is eliminated. Floor-to-floor time is half that with the torch



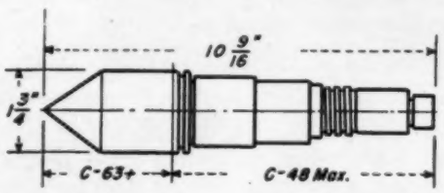
QUADRUPLE COIL . . . Ingenious design and indexing characterizes this fixture, which cut hardening time on a yoke to 2 sec. On a transite base is built up a back support and two side pieces which support the coils. Coils are 2-turn pancakes. Ears of the yoke enter between them, and are open to the quenching Y. Indexing is done by an under-fixture spring carrying a pin which enters a base hole, allowing a long lug to pass between the transite coil supports



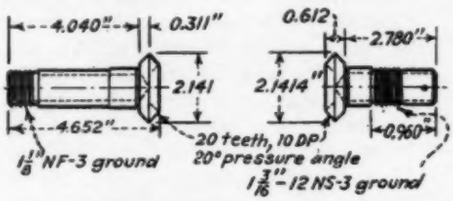
POINT HARDENING . . . Former shoes were formerly hardened all over, requiring later grinding of hole and faces. This fixture, built up of transite and with a transite slide, does the hardening faster and hardens the tip only, avoiding later refinishing. A 2-loop flat coil is used. The part is located on the slide and passed under the coil. It is quenched from overhead



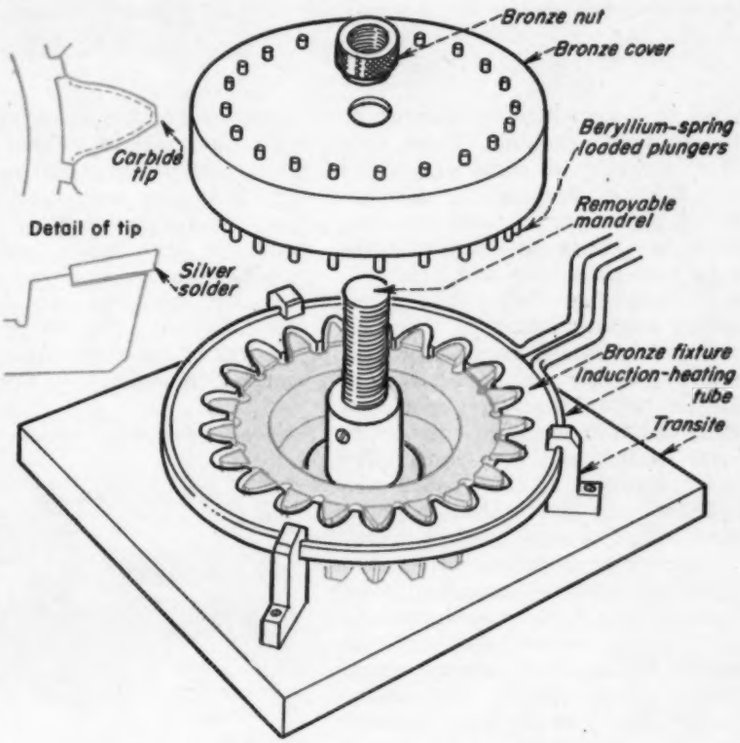
SPRING-PIN LOCATION . . . Twin 3-turn coils heat the fingers of this fork in 20 sec., and quenching is done immediately by spray heads directed at the coils. The fixture supports the fork by a spring-loaded indexing pin in a box at the fixture rear, and is also unusual in that the coil is not built in. The fork fingers thus are given tremendously increased wear resistance



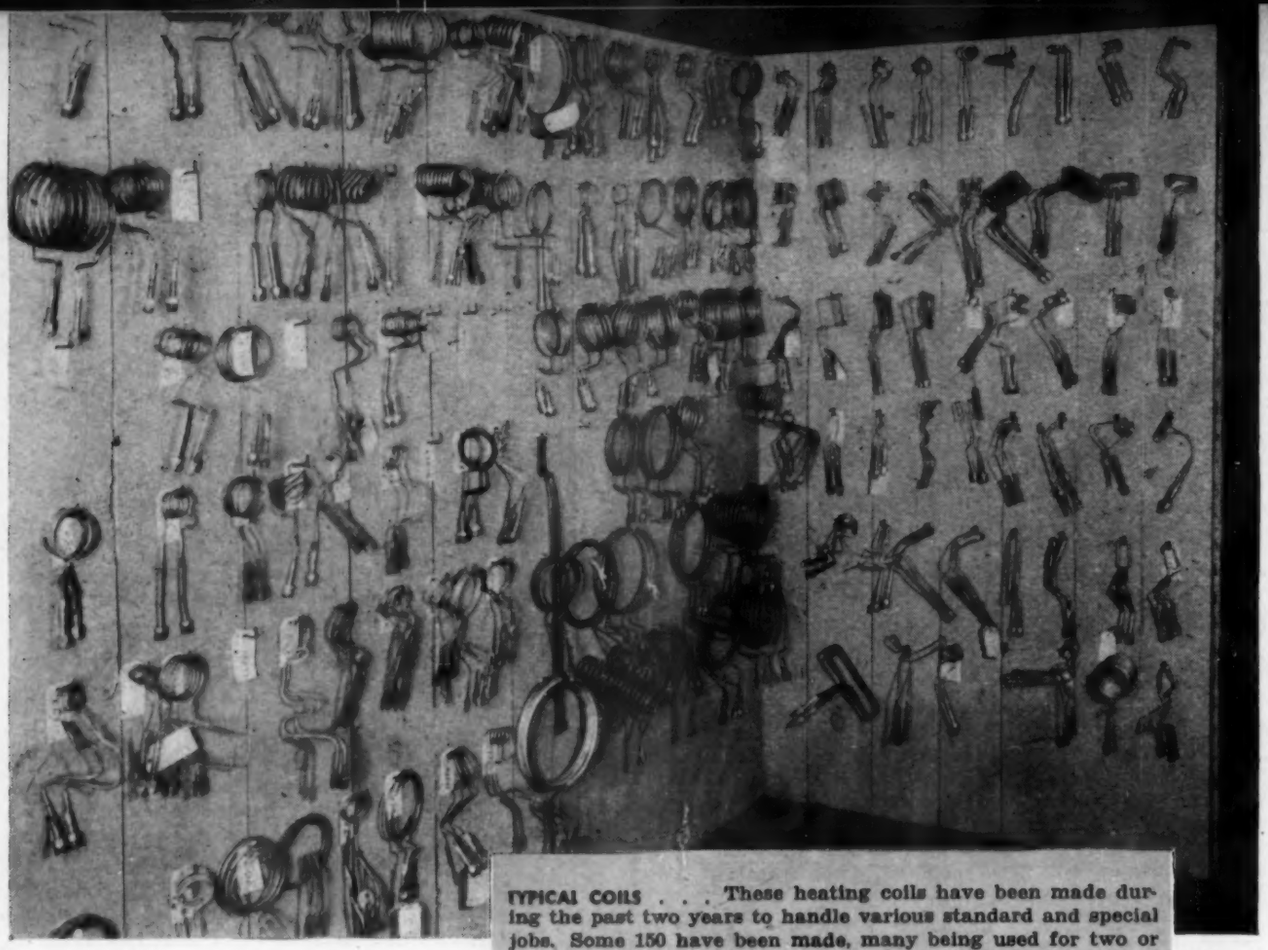
LOCALIZED DRAWING . . . This ball-bearing center, for the Fay automatic lathe, is of oil-hardened steel, SAE 52100, heat-treated to Rockwell C-63+. The neck must be drawn to C-48 max. to remove brittleness. This is done with a single-turn coil, with the shank of the center under water so only the necked area is affected. Previously, the shank is drawn to C-45 with a multi-turn coil, followed by quench. This treatment avoids the tendency to break at the neck



SPECIAL MULTIPLE TREATING . . . These special bevel gears are SAE 4620 steel, carburized 0.020 in. deep, with gear teeth only hardened. Heat-treatment is to quench from 1575 F. in oil, then draw at 300 F. Case must be Rockwell A-77 min., core Rockwell C-25 min. Original method was to harden the gear by immersion in a neutral salt bath in 1 min. Induction hardening handled each of these in 10 sec., floor-to-floor time



MULTI-TIP BRAZING . . . Experimental torch brazing of 20 carbide tips on gear-shaper cutters proved to be uneconomical because of the number of failures from tip cracking. This multi-point fixture does the job in 2 minutes (several times faster than torch brazing) and with entire success. Holding fixture and head are bronze, with bronze plungers loaded by beryllium springs. The cutter is positioned on the removable center pin, and silver-solder inserts are cut to size



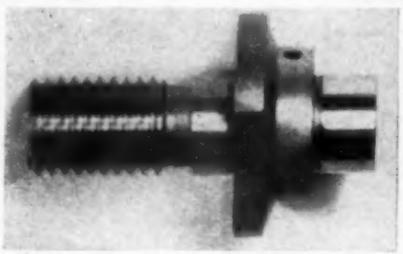
TYPICAL COILS . . . These heating coils have been made during the past two years to handle various standard and special jobs. Some 150 have been made, many being used for two or more parts, of which 134 are shown here—others being built into special fixtures, typical ones of which are sketched

used by housewives for dampening clothes before ironing. These have been, however, in short supply.

A definite advantage in induction hardening occurs on parts requiring multiple treatment—for example, both case-hardening and localized-area hardening. This normally requires copper-plating of the local area before case-hardening, or later removal of the case. With the induction unit, however, various degrees of hardness can be obtained by local heating and quenching, using coils shaped to fit the desired area.

Other jobs for which induction hardening has been adopted include clutch teeth of turret fast-motion clutch assemblies, tempering thread ends on radial-chaser bodies and the like. Some jobs have not been successful because of limited kw. power output of the unit.

Choice of copper-tube diameter has been largely empirical, experience with earlier jobs suggesting the design of later ones. Choice is based on required rigidity, flexibility necessary for shaping, and desired heat pattern. In hardening, usual practice is to use a close-coupled, minimum-turn coil for maximum unit efficiency. On tool steels with over 0.50% carbon, this optimum must be modified by the necessity of holding heating rate below that at which grain enlargement occurs. In tempering, annealing and brazing, however, slower heating is required, combined with exact location, requiring a somewhat looser coupling. Actually, about the only prescribed law followed is that which says the strength of the field varies with the square of distance from work to coil.



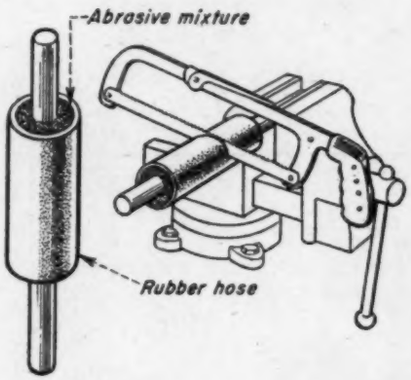
SALVAGE . . . 75 of these roll studs for the Fay automatic lathe were received from a supplier with the roll-stud diameter tempered so extensively by grinding that they were unusable. By induction-hardening this diameter and adjacent face only, pickling to remove stain and wire-brushing the O.D. for polished finish, they were salvaged. Gage checks reveal changes less than 0.0001 in.

A problem in distortion and stability which presented itself in the use of direct-hardening steel for feed screws has been circumvented by the use of NE 8713 oil-hardening carburizing steel. The use of this steel, however, increased the number of operations necessary to produce a hard yet stable screw. In order to take advantage of the economies of a direct-hardening steel, a vertical pneumatic progressive feed fixture is now being assembled to provide uniform feed of the lead screw through the work coil and into an oil spray and agitated quench bath. Experimental work has shown practical application in controlling depth of hardening to below pitch diameter in sizes up to at least 1½ in. O.D.

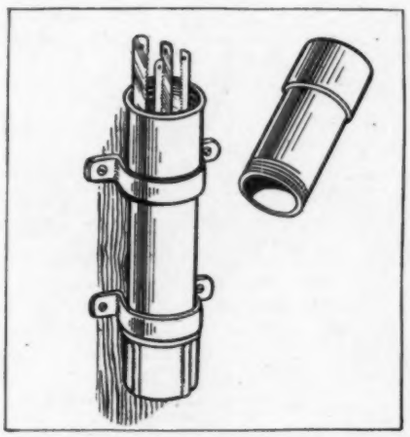
Up to this time, induction heating has been used only on jobs which have been particularly troublesome to process by other methods. Many more jobs than have already been assigned appear suitable, to attain increased speed of heating, reduced number of operations, with ultimate production economies, and more uniform results with a vast reduction in rejects, (particularly where carburizing can be eliminated), salvage, to handle new designs economically, and for other reasons.

Short Cuts FOR THE SMALL SHOP

BY A. H. WAYCHOFF

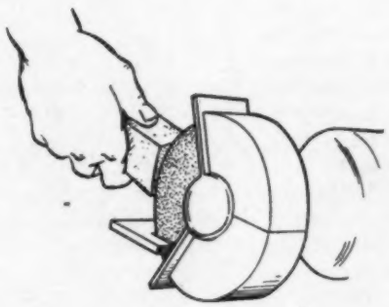


EXTREMELY HARD materials can be cut with a hacksaw in this way. Get a piece of rubber hose slightly larger than the workpiece and slip onto the bar. Plug one end of the hose with waste. Fill the cavity between work and hose with a mixture of fine abrasive and fire clay plus water or dispersed in cup grease. Plug the open end and grip bar in vise. Cut lightly through the tube with a hacksaw, then reverse the blade so its smooth back will be in contact with the work. The blade will carry the abrasive mixture with it and cut its way through any material like hardened tool steel or even substances like glass.

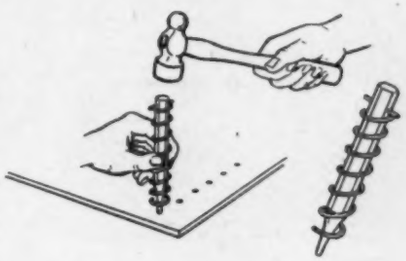


HACKSAW BLADES and similar items are safely and conveniently stored in a holder made of pipe fittings. Screw a cap and a coupling onto a nipple and fasten to the wall with brackets. Make a cover from another nipple and cap. With the cover removed, any blade can be plucked readily from the holder; with the cover in place, the blades are adequately protected. This holder makes for convenience, because blades can not slip into a crack as when stored in the bench drawer.

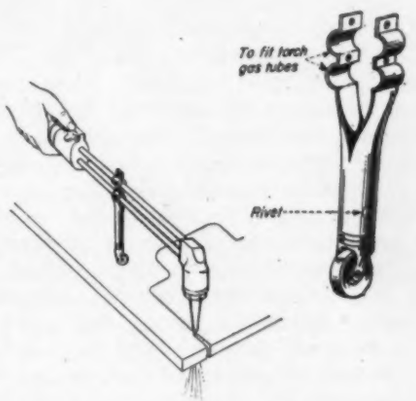
AN OLD OIL MEASURE can be turned into a "pincushion" for small drills, chisels and other items used frequently at the bench. Cut off the measure about 2 or 3 in. from the bottom, fill with lead shot and moisten the shot with oil. The receptacle can not be upset and any small tool can be jabbed into the shot without injury.



LOADING of a grinding wheel with aluminum or other soft metals may be minimized by pressing a bar of hard laundry soap against the wheel at intervals. The embedded particles of soap prevent chips from wedging in the abrasive grain but do not interfere with grinding action.



PUNCH REMOVAL, when making numerous small holes in sheet metal, is assisted by use of a coil spring surrounding the tool. Drill a cross hole in the tool shank and fit with a pin that will act as a stop for the spring. Select a stiff coil spring somewhat shorter than the distance between the pin and the end of the punch. Now when the tool is driven through the sheet, the compressed spring will push it out without need for wiggling to free the tool.



A CUTTING-TORCH GUIDE, which permits cutting layouts to be followed with less operator fatigue, can be made from a furniture caster and a piece of tubing. Split the tubing lengthwise and form the cut ends to clamp around the gas tubes of the torch. Drill a cross-hole at the lower end to rivet the caster tang in place in the tube. If a freely turning caster is used, the combination torch support and guide will enable the operator to follow the cutting layout with ease. It will also, if applied to a welding torch, aid him when welding seams in large flat work.

How to Measure

Surface Roughness of Castings

After study of various devices for measuring surface roughness, a simple instrument was devised for application to castings

BY G. HOBMAN

INTERNATIONAL MEEHANITE METAL CORPORATION, LTD.

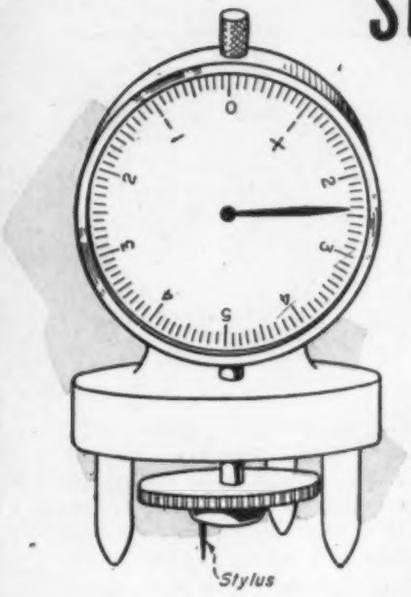
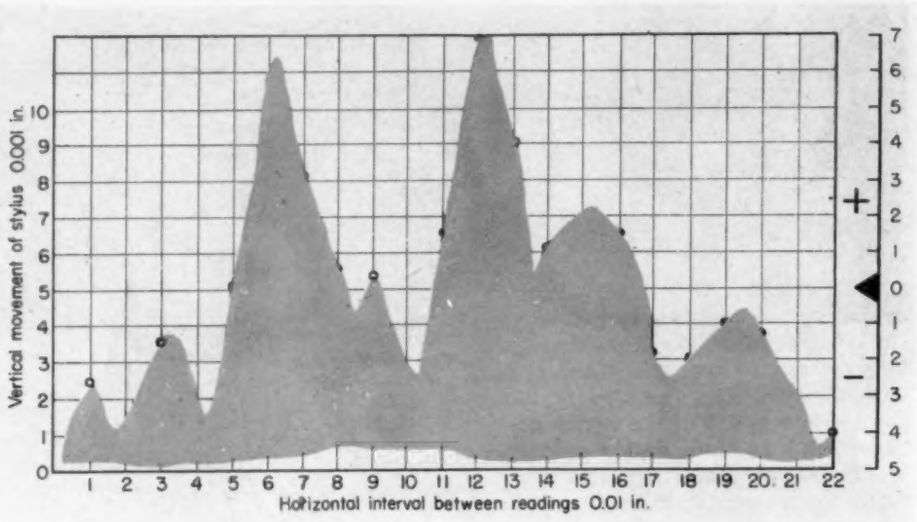


Fig. 1—Direct measurement of surface roughness (at right angles to the plane of the surface) can be made with the Hobman-Meehanite Surface Meter



DIMENSIONAL accuracy of castings is regarded as important by both the foundry and the consumer, but suitable tolerances have not been defined. The tendency is to narrow tolerances on castings for numerous purposes, and complaints of inaccuracies as small as 0.02 in. are not novel. And when tolerances are small, surface finish has an important bearing on measurement.

To evaluate the surface roughness of castings, a simple direct-reading instrument of the stylus type is required, together with a classification system for various degrees of surface roughness found in commercially produced castings. The Hobman-Meehanite Surface Meter, Fig. 1, meets foundry needs and those of customers in that it is direct-reading, portable, withstands rough usage, is low in cost and is non-destructive in operation.

The Surface Meter consists of a tripod support with the contact points machined to 1/16 in. (with flat bottom) to prevent rocking when placed on the casting and also to prevent penetration of surface irregularities. The operating disk carries a phonograph needle offset 0.079 in. from center, so rotation of the disk will cause the needle to traverse a circle of ½-in. periphery. Fifty graduations around the disk enable the operator to traverse the needle in. 0.01 in. increments. Vertical movement of the stylus is indicated by a dial-gage reading in 0.0005 or 0.0001 in. divisions.

The instrument is held in contact with the casting while the disk is lifted, rotated and lowered

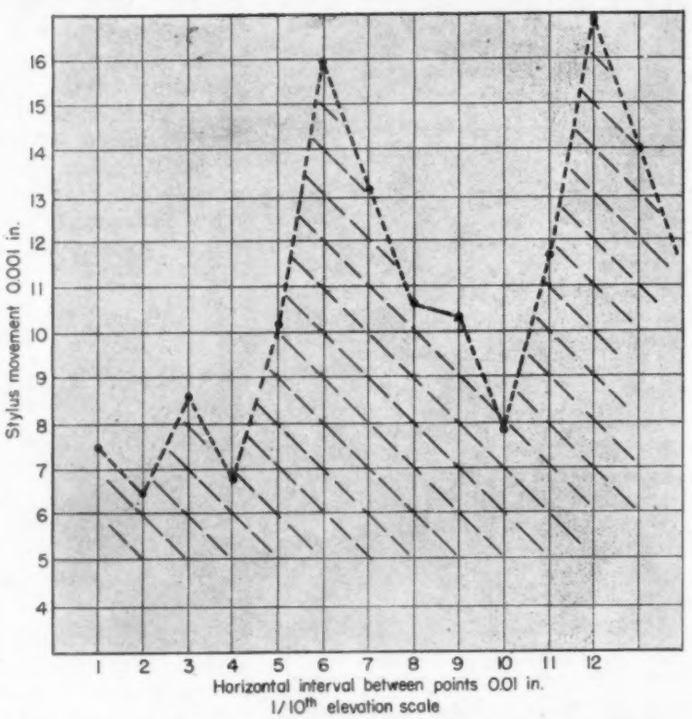


Fig. 2—An enlarged representation of a surface profile is produced by plotting vertical and traverse movements of the instrument stylus, but this is not often necessary considering the roughness classifications developed

progressively from division to division. Dial-gage readings are recorded for the respective increments of stylus traverse. By graphical representation, Fig. 2, it is possible to produce an enlarged impression of the explored surface. The results are considered typical for the area of the circle described by the stylus. Of course, absolutely identical results will not be obtained if the test is repeated on the same location, but the differences in readings are minute and the general characteristics of the surface are unaltered.

Surface-finish measurements are made in terms of the average height (H-ave.) of the crests and roots in relation to a centerline and in terms of root mean square of average height (H-rms.) of crests and roots above or below a centerline. In use of the Surface Meter, readings of ordinates are taken at 0.01 in. increments and recorded (Col. 1 in table). Deviations from the mean value are tabulated in Col. 2. To obtain the root mean square values the deviations are squared, Col. 3, and the square root of the mean square obtained. In the example, the mean square is 8.02 and the square root or H-rms. is 2.8.

Typical Recording of Roughness Data
(Using Random Zero on Dial Gage)

Reading Number	1 Reading inch/1000	2 Deviation from mean of 9.6	3 Square of Deviation
		Mean R value 9.6	
1	7.5	2.1	4.41
2	6.5	3.1	9.61
3	8.6	1.0	1.00
4	6.8	2.8	7.84
5	10.1	.5	.25
6	15.9	6.3	38.90
7	13.1	3.5	12.25
9	10.4	.8	.64
10	7.8	1.8	3.24
40	13.0	2.4	11.46
42	11.6	2.0	4.00
43	7.0	2.6	6.36
44	7.5	2.1	4.41
45	10.5	.9	.81
46	11.0	1.4	1.96
47	11.6	2.0	4.00
48	12.4	2.8	7.84
49	10.3	.7	.49
50	10.0	.4	.16
Sum of squares	(Meam 9.6)		400.89
Mean Square			8.02
Roughness (Root-Mean-Sq)			R2.8

Classification of Surface Roughness

Class	Symbol	Range of Roughness H-rms. values in thousandths
O	R¼	Zero to 0.250
A	R½	0.251 to 0.500
B	R1	0.501 to 1.000
C	R2	1.001 to 2.000
D	R4	2.001 to 4.000
E	R8	4.001 to 8.000

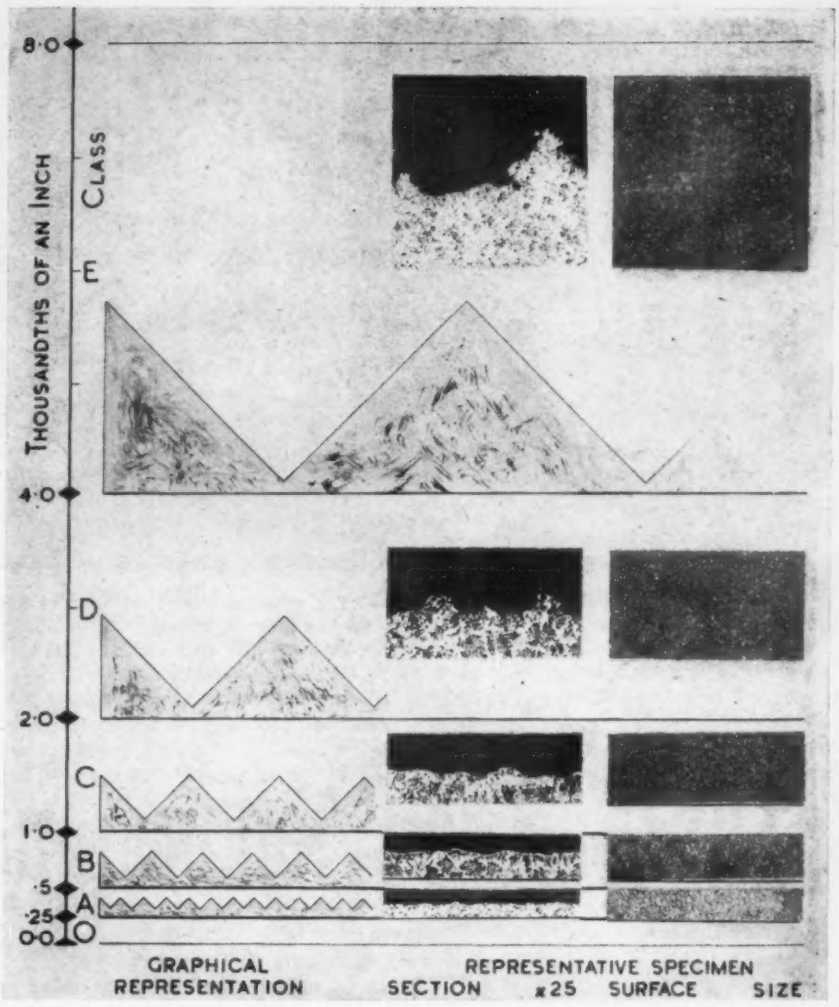


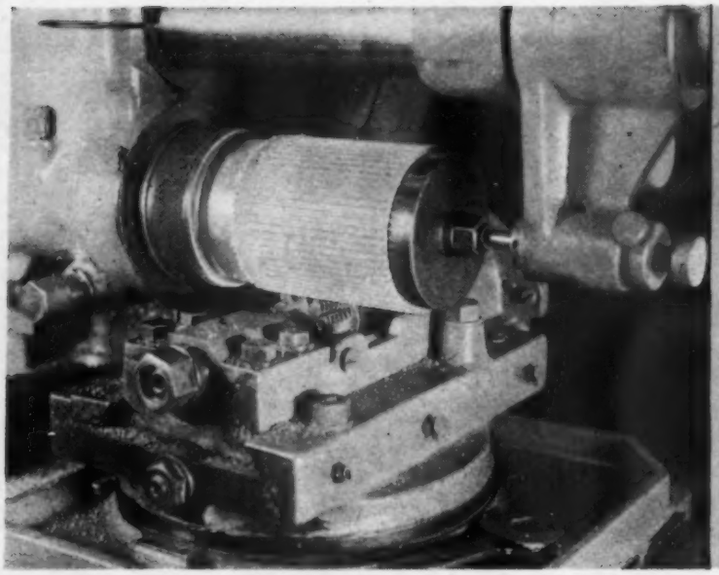
Fig. 3—Comparison Chart of Surface Roughness Classification

To classify surface roughness in simple terms, the symbol *R* is taken to indicate surface roughness, followed by a number indicating the H-rms. value in thousandths of an inch. Thus, R1.8 denotes an H-rms. value of 0.0018 in.

Ranges in surface roughness can be grouped in six classifications that cover all normal ranges of surface roughness presently encountered and also finer surfaces should they be produced in the future. These six classifications are listed at left.

These surface roughness ranges are arranged on a logarithmic basis to provide a smaller range in each class as the roughness decreases. Variations in skin finish will occur at various parts of the casting, but the *R* value will fall within the range; that is, within 50 to 100% of the magnitude of the maximum value. However, when a core is used to form one face of a casting and green or dry sand another face, the two faces should be reported separately. And in reporting a casting the nomenclature will be for example: "R1.2—Class C", the first figure giving the actual surface roughness.

In the case of rougher skin finishes —upwards of *R*1.5—it is not necessary to read and record stylus movement for the 50 increments of traverse. Merely operate the needle in contact with the sample for one complete revolution, meanwhile estimating the mean value of the dial-gage readings. Set the gage zero to this mean value and record dial-gage readings for the various increments of traverse. Square the readings, divide the sum of the squares by 50 and obtain the square root. For finishes up to R1.5, 25 readings will suffice.



TOPPING-TYPE HOBS are recommended for most carbide hobbing applications on non-metallic materials because they remove the burrs thrown up at the tops of the gear teeth. To date, only straight-gash shell hobs have been made and they usually have tapered holes to insure concentric mounting and greater rigidity

CARBIDE TIPS are made as solid strips brazed in place in each gash, rather than in the form of individual tooth tips that must be brazed separately. Tip strips for coarse-pitch hobs are preformed; for fine-pitch hobs are rectangular bars, form-ground

CARBIDES Hob Non-Metallic Gears

BY LEO W. REULAND
Superintendent, Small Tool Division
BARBER-COLMAN COMPANY

CARBIDE-TIPPED HOBS have, in recent years, been used very successfully for hobbing abrasive materials such as laminated phenolic plastics, fiber and molded asbestos, including moldings having wire inserts for stiffening. All these materials dull steel hobs quickly, making hob cost a major item of expense. Carbide-tipped hobs also can be used successfully for cutting aluminum gears, and some experimental work has been done in hobbing brass and cast-iron gears.

As long ago as 1938, the Barber-Colman Company was asked to solve a serious problem of rapid hob wear in an operation involving hobbing of very abrasive Fibrox timing gears having 66 20-pitch teeth and ⅜-in. face width. This bakelized fiber was so abrasive that high-speed-steel hobs dulled after cutting only 280 gears with a 7-setting hob, or 40 gears per setting. Allowing 13 sharpenings per hob, only 3,640 gears could be expected.

The 3-setting carbide-tipped hob having 12 gashes which replaced it has, during the past nine years, produced an average of 10,000 to 12,000 gears per sharpening, or 4,000 per setting. This hob has been resharpened six times, with about 0.060 in. of material ground away from each face. With a conservative estimate of 15 sharpenings during its life, this hob should produce the staggering total of 180,000 gears. In addition, these gears are of better quality because wear on hob teeth is negligible while cutting one arbor-load.

This successful application prompted establishment of an experimental program on carbide hobs. This has included careful study of variables in carbide hobbing, such as feeds and speeds, grades of carbides, rake angles, cutting clearances, chips, and limitations of existing machines. Results of experiments, together with successful field applications, have proved that for many applications, particularly in cutting non-metallic materials, the carbide hob will quickly pay for itself even when machining rates are the same as those with steel hobs. Results thus far in hobbing steel and cast-iron gears have not been sufficiently conclusive to permit recommendation of carbide hobs unless a test run indicates otherwise.

Increased production between sharpenings of carbide-tipped jobs makes tool cost per piece low in hobbing plastic gears

Carbide hobs have proved successful to date in the range from 4 to 120 diametral pitch. This range can be broadened, and the field of application enlarged practically overnight to be consistent with the rapidity with which carbide hobbing has progressed in recent years.

Next to be made for field use was a 30-D.P., single-thread hob designed to cut a 36-tooth, ¼-in. face, fiber gear. The material was so abrasive that only 40 pieces could be hobbed per setting of an 11-setting high-speed-steel hob, a production of 440 pieces between sharpenings. A carbide-tipped hob with six settings produced 6,000 gears per setting, or 36,000 gears per sharpening. Eight gears were loaded on each arbor, giving a 2-in. length of cut.

Feed per revolution of the work was set at 0.090 in. and cutting time was 80 sec. With an average removal of 0.007 in. of carbide stock from each cutting face per sharpening, and 15 sharpenings during life of the hob, total production was about 540,000 gears. This so reduced tool cost per piece that the high initial cost of the carbide hob was actually a very low tool cost per piece machined.

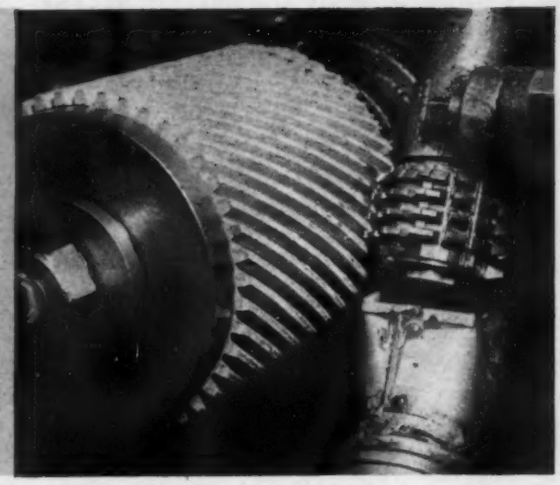
In rapid succession, 8-, 10- and 12-pitch carbide hobs were produced. An especially interesting application was in a plant making 42-tooth, 8-D.P. Micarta camshaft gears of ⅞-in. face width. With high-speed steel hobs, wear during the cutting of an eight-blank arbor load produced a variation of 0.004 to 0.005 in. between the first and eighth blank. Hob speed was 300 rpm. and feed 0.115 in. per revolution of the work. Cutting time for the 8-blank load, with a 7-in. length of cut per load, was 14 min. Total gears produced per sharpening with a 4-setting hob was 32 pieces, of which several were not within required tolerances. High-speed steel hobs simply would not hold the sharp cutting edges needed for hobbing to the specified tolerances.

A single-setting carbide hob costing four times as much was applied on this job at the maximum machine speed of 350 rpm.—only 50 rpm. increase. This hob produced more than 2,000 pieces without dimensional variation—an increase of 62 times in quantity per sharpening, uniform work without rejections, and a material reduction in down time for hob sharpening and resetting. This hob is expected to last through 20 sharpenings, or a total of 40,000 pieces.

This example revealed the limitations of machines designed for steel hobs. Hob speed was increased from 300 to 350 rpm. With feed per revolution of the work maintained at 0.115 in., cutting time was reduced from 14 to 13 min. Had this machine been capable of greater operating speeds, cutting and floor-to-floor times would have been reduced.

In another plant Micarta timing gears of 10 D.P. with 54 helical teeth were cut in lots of five, giving a 3⅜-in. length of cut per load. The conventional steel hob produced 2,500 pieces per sharpening, the new one 15,000 pieces per sharpening. Hob speed in both cases was 573 rpm., the maximum possible on the machine. Production per sharpening thus was increased six times.

The accompanying table shows production data from a number of recent installations. In the case of



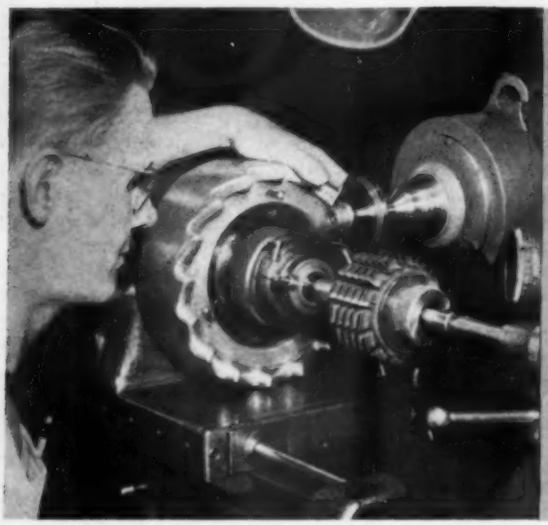
A SUCTION EXHAUST system is desirable to remove chips as rapidly as they are produced. Otherwise, the atmosphere soon would become very uncomfortable for the operator, and the machine would be covered with a fine and very abrasive dust

TYPICAL RECENT CARBIDE HOBBING INSTALLATIONS

HOB MATERIAL	GEAR MATERIAL	DIAM. PITCH	NO. OF TEETH	FACE WIDTH (INCH)	LENGTH OF CUT PER LOAD (IN.)	PIECES PER SETTING	NO. OF SETTINGS	PIECES PER SHARPENING	NUMBER OF SHARPENINGS*	PIECES PRODUCED DURING LIFE OF HOB*
H.S.S.	Micarta	8	44	⅞	7	8	4	32	15	480
Carbide	Micarta	8	44	⅞	7	2,000	1	2,000	20	40,000
H.S.S.	Bakelite Scrap	8	44	⅞	7	16	10	160	15	2,400
Carbide	Bakelite Scrap	8	44	⅞	7	3,500	1	3,500	15	52,500
H.S.S.	Micarta	10	50	⅞	7	24	4	96	15	1,440
Carbide	Micarta	10	50	⅞	7	———	1	2,000	20	40,000
H.S.S.	Micarta	10	54	⅞	3⅜	———	5	2,500	15	37,500
Carbide	Micarta	10	54	⅞	3⅜	———	3	15,000	20	300,000
H.S.S.	Fibrox	20	66	⅜	———	40	7	280	13	3,640
Carbide	Fibrox	20	66	⅜	———	4,000	3	12,000	15	180,000
H.S.S.	Fiber	30	38	¼	2	40	11	440	12	5,280
Carbide	Fiber	30	38	¼	2	6,000	6	36,000	15	540,000
H.S.S.	Insuroc	32	47	1 3/32	2 3/16	100	5	500	15	7,500
Carbide	Insuroc	32	47	1 3/32	2 3/16	1,500	4	6,000	10	60,000
H.S.S.	Insuroc	36	53	1 3/32	2 3/16	100	5	500	15	7,500
Carbide	Insuroc	36	53	1 3/32	2 3/16	1,500	4	6,000	10	60,000
H.S.S.	Bakelite	42	63	⅜	¾	100	5	500	15	7,500
Carbide	Bakelite	42	63	⅜	¾	3,000	4	12,000	10	120,000
H.S.S.	(Paper Base	120	———	———	———	700	4	2,800	———	———
Carbide	Phenolic)	120	———	———	———	3,750	4	15,000	7	105,000
Carbide	"	120	———	———	———	4,500	4	18,000	7	126,000
Carbide	"	120	———	———	———	5,750	4	23,000	7	161,000

*NOTE: These necessarily must be estimated figures as in no case has the carbide-tipped hob been completely expended.

the 32 and 36 D.P. Insuroc leadscrew gears (cut in the plant of a manufacturer of electrical control equipment), the steel hobs were operated at 309 rpm., with a feed of 0.020 in. per revolution of the work. With the carbide-tipped hobs, cutting speed was increased to 533 rpm., the maximum available with the standard swivel of the Barber-Colman No. 3 hobber used. Feed per revolution of work was doubled to 0.040 in. This, of course, resulted in better performance and in reducing the cutting time per load of two gears per arbor from 17 to 4.2 min. for the 32-pitch gear and from 20 to 5.5 min. for the 36-pitch gear. In each case, the number of pieces obtained during the estimated life of the hob was increased eight times. Steel hobs were set for conventional cutting, while climb cutting was used for carbide-tipped hobs.



CARBIDE - TIPPED HOBS for cutting non-metallic gears are sharpened dry with resinoid-bonded diamond saucer wheels. These wheels are dressed with aluminum-oxide or silicon-carbide grinding wheels. Good results have been obtained by using dressing wheels of 180 to 220 grit, approximately "Q" hardness. Usually, only 0.005 to 0.010 in. need be ground off cutting faces per sharpening

The 42-pitch Bakelite gear, from the same plant, has a pitch diameter of 1.500 in. and a helix angle of 3° 1 min. Width of face is ⅜ in. and two gears are loaded on each arbor, making length of cut per load ¾ in. The steel hob was operated at 309 rpm., with feed of 0.020 in. Cutting time was 10 min. This was reduced to 2.6 min. when the carbide-tipped hob was used at 533 rpm., and feed was increased to 0.040 in. per revolution of the work. The 120,000 pieces obtained during life of the carbide-tipped hob is 16 times that with the conventional H.S.S. hob. In both cases, no cutting fluid was used.

The 120-D.P. paper-base phenolic gear is of special interest because the user ran a complete comparative test. Heretofore, this manufacturer had been cutting 14 arbor loads of gears, with 50 pieces per arbor, on each setting of the H.S.S. hob. In almost every case, after the fourteenth arbor load, gears had burrs that exceeded the allowable limit of 0.001 in. Tooth form on the fifteenth arbor load was fair, there was medium granulation and no fracture. Wear on the steel hob was almost at its maximum by the time the fifteenth arbor load was cut.

For the first test run with the carbide-tipped hob, speed and feed settings were not changed. Hob speed was 1,300 rpm., obtained on the No. 3 hobbing machine with a high-speed swivel. Feed was 0.030 in. per revolution of the work arbor. A total of 75 arbor loads (3,750 gears) were cut before the extended burr exceeded the allowable limit of 0.001 in. Tooth form was good, granulation slight, and there were no fractures. Hob wear was slight, being about half of that produced by cutting 14 arbor loads with the steel hob.

A second test with a cutting fluid produced 75 successful arbor loads. Rejection on the 76th arbor occurred because the extended burr slightly exceeded the allowable limit. Tooth form was just passable, there was medium granulation, and no fracture. Hob wear was at least one half greater than in the first test with the carbide-tipped hob.

Because carbide-tipped cutting tools usually operate better at higher speeds and feeds than normal steel tools, the rate of feed was increased 50%, or from 0.030 to 0.045 in. per revolution of the work, for the third test. As a result, 90 arbor loads (4,500 gears) were cut before a rejection. Thus, potential production per sharpening of this four-setting hob was increased from 15,000 to 18,000 gears just by increasing the feed 50%. For this test, no cutting fluid was used.

In the final test, table feed was increased to 0.060 in. per revolution of the work, or double that formerly used. As a result, 115 arbor loads (5,750 gears) were cut before a rejection occurred. Using this last value, pieces produced per sharpening with a 4-setting hob would be 23,000, slightly better than eight times that normally expected from a 4-setting steel hob.

This carbide-tipped hob was designed for a normal life of seven sharpenings based on removal of 0.010 in. from each the twelve faces at each sharpening. This would bring expected productive life to 161,000 gears at a cutting speed of 1,300 rpm. and feed of 0.060 in. per revolution of the work. Undoubtedly, this could have been increased materially had it been possible to increase machine speed.

Cutting Speeds

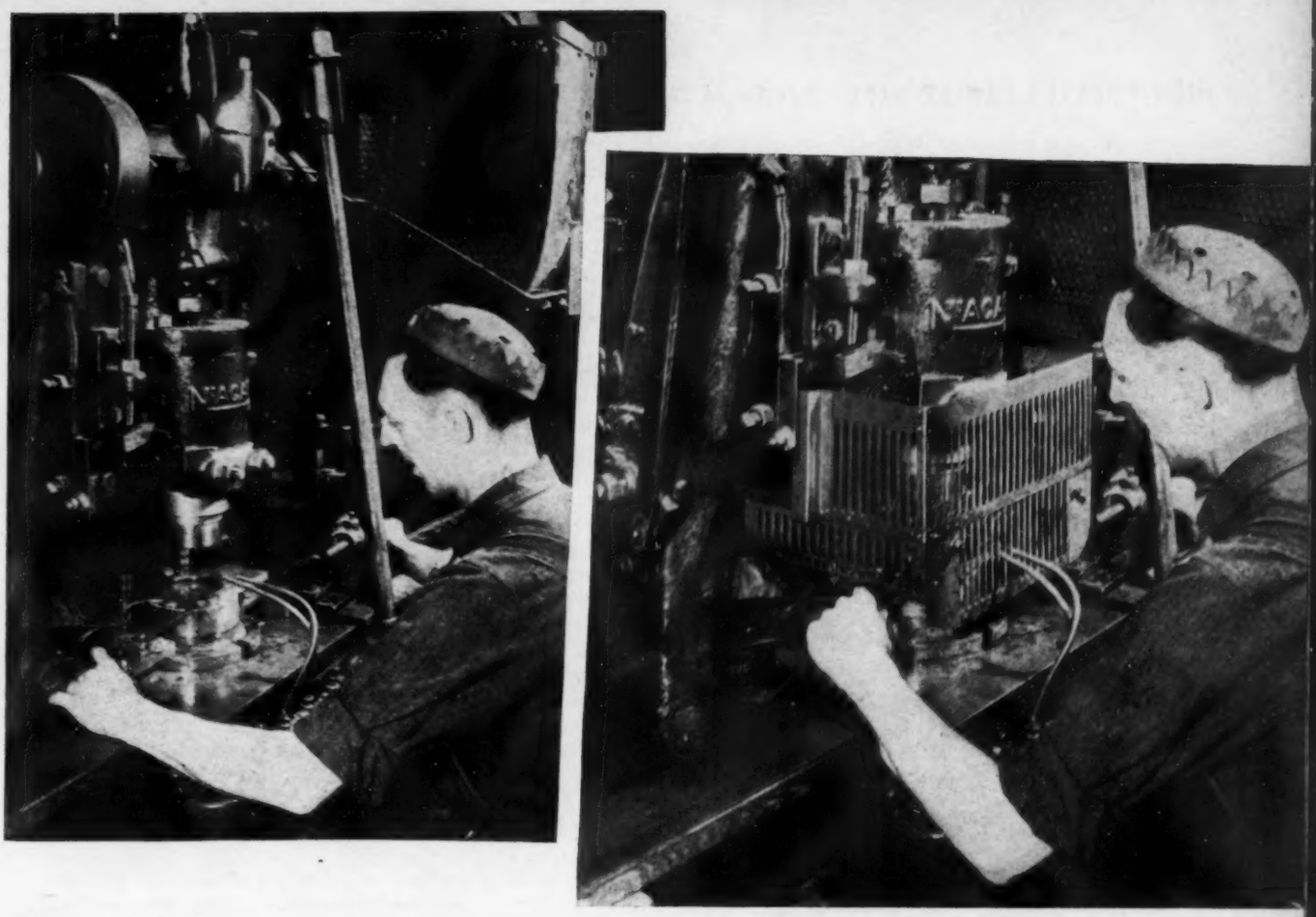
With carbide-tipped hobs, cutting speeds seem to be limited only by available equipment. Even the most modern hobbing machines are not designed for carbide-tipped hobs.

After considerable development, including refinement of the tip-brazing process, Barber-Colman has found that straight gashed hobs are best for carbide tipping, with tips in each gash in one continuous strip, rather than individual tips brazed on each tooth.

To date, straight tungsten carbides in the familiar cast-iron cutting grades have proved most satisfactory for tipping. Usually, these hobs are ground to the same shapes and dimensions as those of steel, although more clearance often is provided for cutting non-metallic materials than for cutting metal gears.

Sharpening is done dry with diamond wheels. Normally, it is only necessary to grind 0.005 to 0.010 in. off the cutting face of each gash when resharpening, considerably less than when sharpening steel hobs in the same service.

Taper-hole hobs are recommended for carbide hobbing, both to eliminate eccentric mountings and to increase the rigidity of the hob drive. In no case has it been found necessary to use a cutting fluid with a carbide-tipped hob when machining non-metallic gears.



STRIP-FEED DIES (left) seldom are provided with effective guards. This compound blanking and forming die has a roll-feed device and the operator sometimes finds it necessary to place his hands in the danger area. Application of an enclosure guard (right) provides protection for this otherwise difficult-to-guard operation. The guard is mounted on the ram guides, and is designed so it can be used in a number of other setups

Punch Presses CAN Be Safe

BY W. A. VOLLMER, CHIEF PUNCH PRESS ENGINEER
EMPLOYERS MUTUAL LIABILITY INSURANCE CO. OF WISCONSIN

PROPER GUARDING of punch-press operations is too often considered difficult. This is not the case. If those responsible for designing dies give careful thought to safe operation, and if those responsible for the use of the dies will see to it that they are set up properly and that guards furnished are used correctly, protection of operators usually can be an easy task.

Methods commonly used to guard the point of operation on punch presses are:

1. A ⅜-in. maximum stroke of the press ram.
2. A complete enclosure of the front and two sides of the die.
3. A gate guard.
4. A pull-out guard.
5. A horizontal-action sweep guard.
6. A vertical-action sweep guard.
7. A two-hand trip.
8. A two-pushbutton or finger trip.

It is commonly conceded that when the punch-press has a ⅜-in. maximum stroke of the crankshaft, the operation will be safe and no guard will be needed. In fact, this is stated in some State safety codes. But in most punch and die setups where the stroke is ⅜ in. or less there is still some chance for an operator to place the end of a finger, or more than one finger, between punch and die, and suffer amputation. A typical instance is where a flat-sheet corner-trimming or notching operation is being performed without using a stripper, an enclosure guard properly set will help eliminate danger to the operator.

With ingenuity, most punch-press work can be set up to include enclosure-type guards, usually with an increase in production

An enclosure guard (sometimes known as a fixed-barrier or a stationary-barrier guard) can be used on a wide variety of press operations with virtually complete protection for the operator. For most press

operations, this is the safest type of guard that can be employed. The first concern of the die designer should be to arrange the die so an enclosure guard can be used, as this will provide the most efficient protection, and in most cases result in increased speed of operation.

Often an enclosure guard can be made as an integral part of the individual die. In most cases, it is a separate, adjustable guard arranged so it can be used to enclose a number of different dies. In all cases, openings must be so small that the operator cannot insert a finger far enough through the guard to enter the danger zone. In addition, there should be no pinch points at the top of the guard.

Proper strippers, guides, stops and clearances should be provided on blanking, progressive, and compound dies, piercing and forming dies, cutting-off dies, and those used for notching, trimming and piercing flat sheets so enclosure or barrier guards can be used. In some cases an apron or feed chute extended from the die to a position outside the guard, and fitted with proper guides, will facilitate handling of the part being fed into the die.

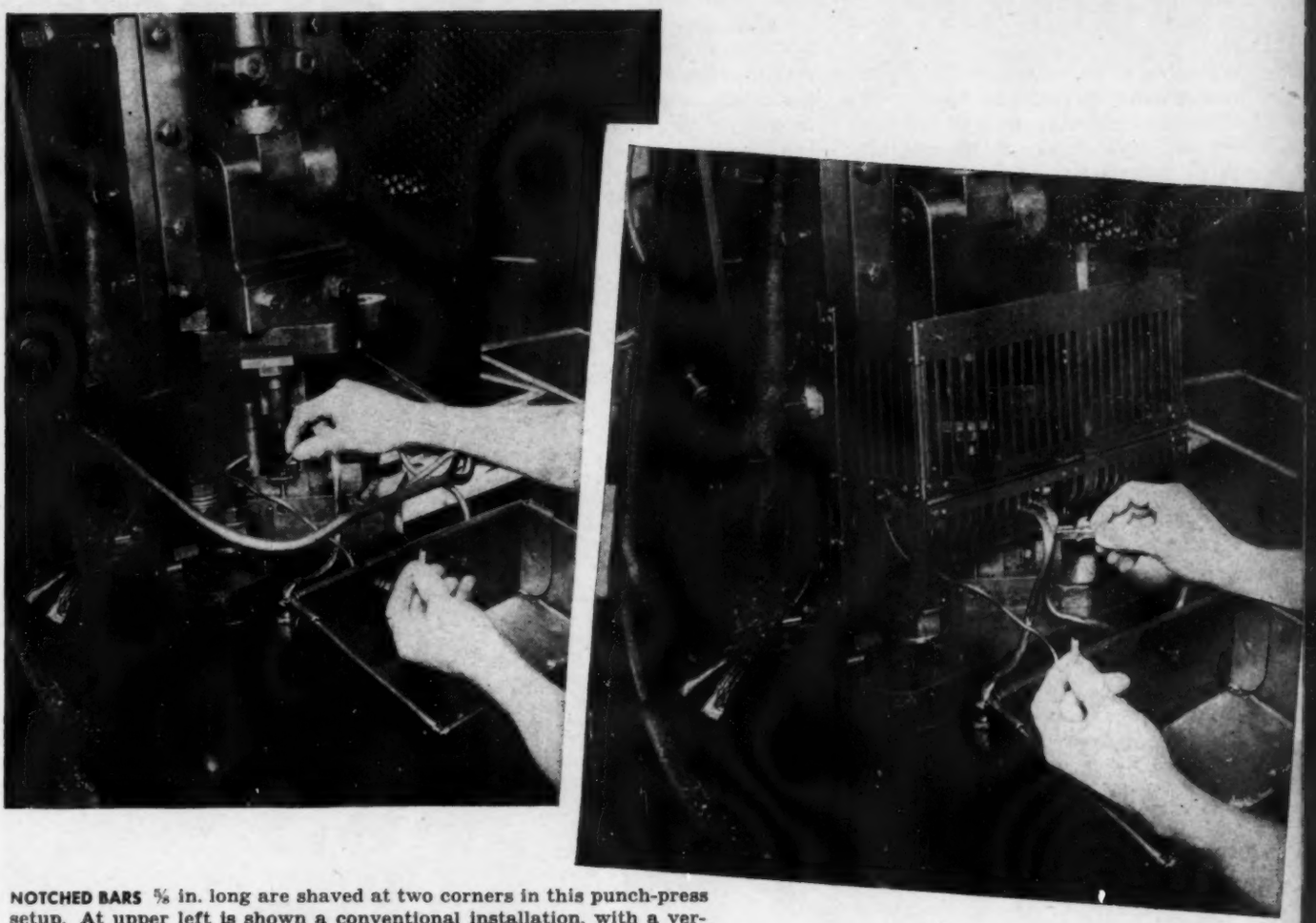
When gravity chute or slide feeds are used, it is important to have some type of positive automatic ejection, permitting an enclosure guard. This type of feed can be applied on such operations of a secondary nature as drawing, forming, piercing, and broaching. With an inclined press, mechanical or air ejection is not always necessary. In either case, speed of operation can be increased when automatic ejection is provided. Examples of enclosure guards are shown on these pages.

When an enclosure-type guard cannot be used, it is desirable to employ some type of mechanical guard. The one to select is the one that reduces the chances for failure to a minimum. Most guards are sold on the merits of their good points of protection, but unfortunately the points where failure of the guard may occur and where the guard will not protect the press operator are rarely brought to the attention of the purchaser.

A gate guard is generally considered as one that descends to a lower position on actuation of the clutch trip pedal. If properly adjusted, such a guard will not permit actuation of the clutch unless the operator's fingers are out of the danger zone. There are several different arrangements of this type of guard. In deciding which type to select, the purchaser should consider the chances each type might have to fail, and select the one that eliminates the most chances and also provides the widest range of protection on various press operations.

A pull-out guard is one in which ropes or cables are attached to the ram of the press and to both hands or elbows of the operator so that

SECONDARY PRESS OPERATIONS on drawn shells frequently involve placing the part into the die or onto an inverted punch. In the conventional setup (left) the operator reaches into the danger area to position the piece. Usually a sweep guard is employed, since other types would interfere with production. An enclosure guard (below) is easy to apply to such press operations if chute feeds are provided; in this case gave 20% increase in production

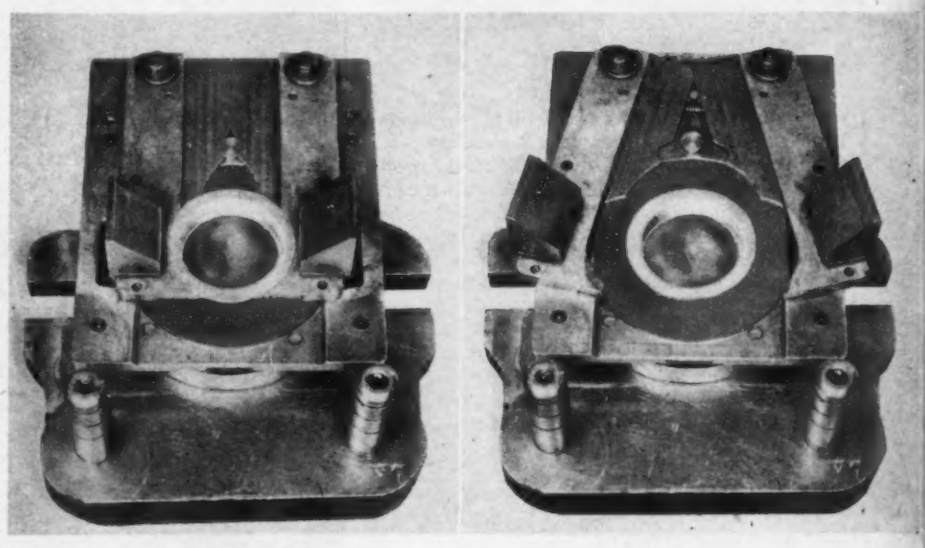


NOTCHED BARS ⅝ in. long are shaved at two corners in this punch-press setup. At upper left is shown a conventional installation, with a vertical sweep guard. By adding a progressive-type hand push feed to the die, any need for the operator to reach into the danger zone was eliminated. This made it possible to enclose the working area with stationary-barrier guard (right). Production jumped 20% as a result

when the ram descends the fingers will be pulled out of the danger zone. Moving parts, subject to wear on this type of guard, should be inspected regularly for proper maintenance, and also should be properly adjusted each time a different operation is to be performed, or a new operator is assigned to the press.

A horizontal-type sweep guard is connected to the ram of the press, and arranged to sweep from one side of the press to the other. It must have sufficient travel positively to force both of the operator's hands out of the danger zone, and not by itself create another hazard. Often an operator will reach around the side of such a guard, or it will be so adjusted that it will pass over the hand or arm of the operator. Frequently also such guards are placed to pass too close to bolts or some other part of the die or bolster plate, creating another hazard.

Vertical-type sweep guards have the same basic features as the hori-

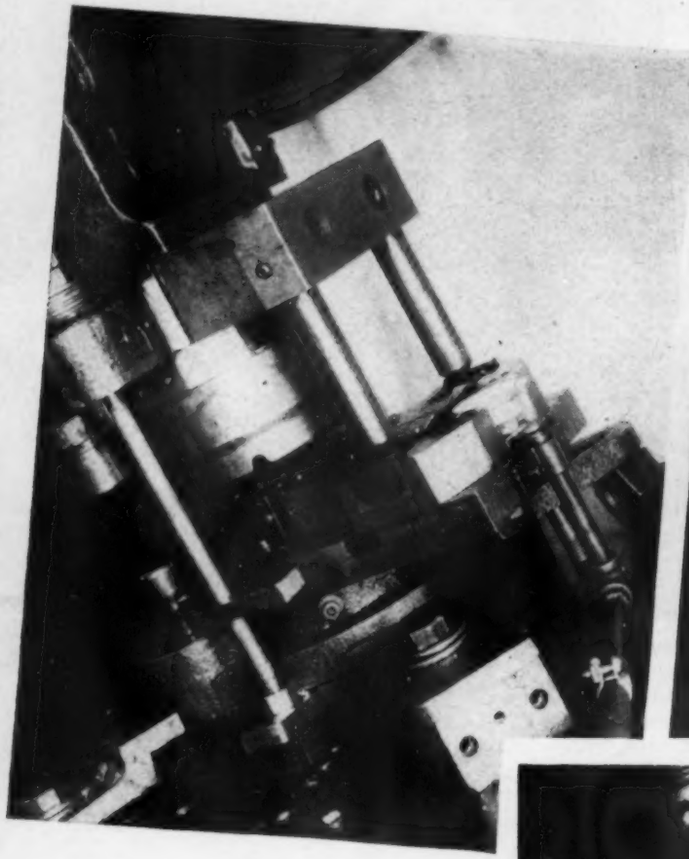


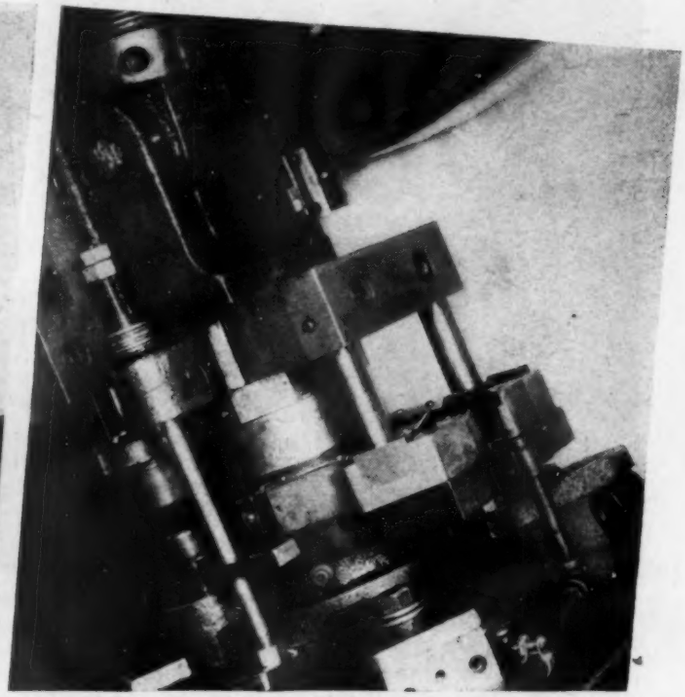
CHUTE FEEDS can be provided, even when the part must be nested in the die. Here, a flanged shell must be dropped into the die ring before the press ram descends. The die designer has provided chute guide members which are swung aside by action of cams as the ram moves down, providing clearance for the hold-down ring. A tension spring pulls the arms back to feeding position after the part has been ejected

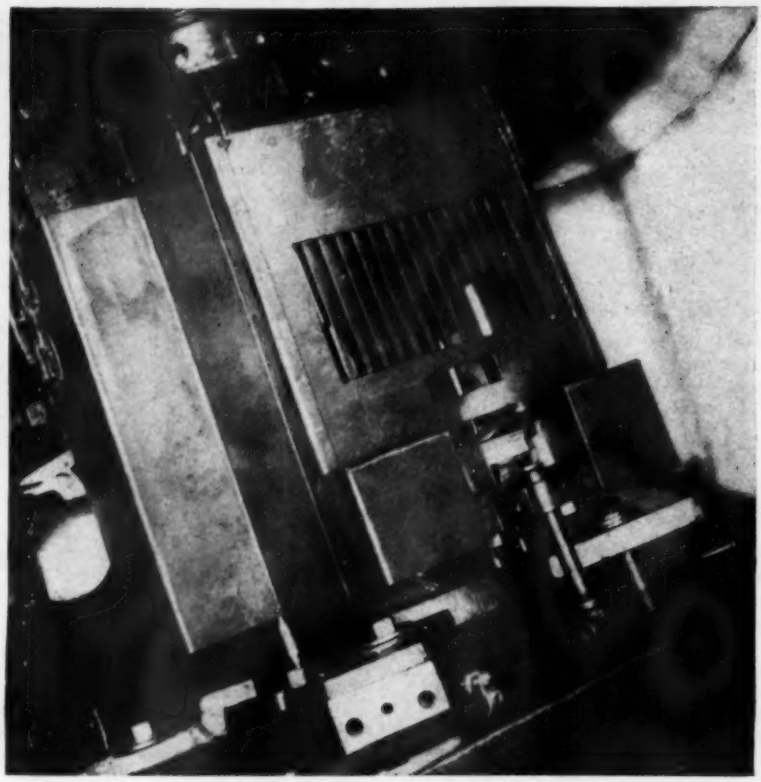
zontal-type sweep guards, and must be adjusted carefully for each operation. Because they do not enclose all three outer sides of the working area, sweep guards cannot be considered entirely safe.

Two-hand trips require that both of the operator's hands are occupied away from the working area while tripping the clutch of the press. This type of guard should be made so that it will be impossible to actuate the clutch unless both levers are returned to the neutral position before another cycle can be started. There have been many cases where operators tied down one arm of a two-hand trip, and operated the press with only one trip lever.

The two-hand trip should not be used on presses where the speed of the ram is so slow as to permit the operator to put his hand or hands back into the danger zone after depressing the trip levers. When electric- or air-operated buttons are used on other than positive-clutch presses, they should be so designed and connected that if either hand is taken off a control button before the ram



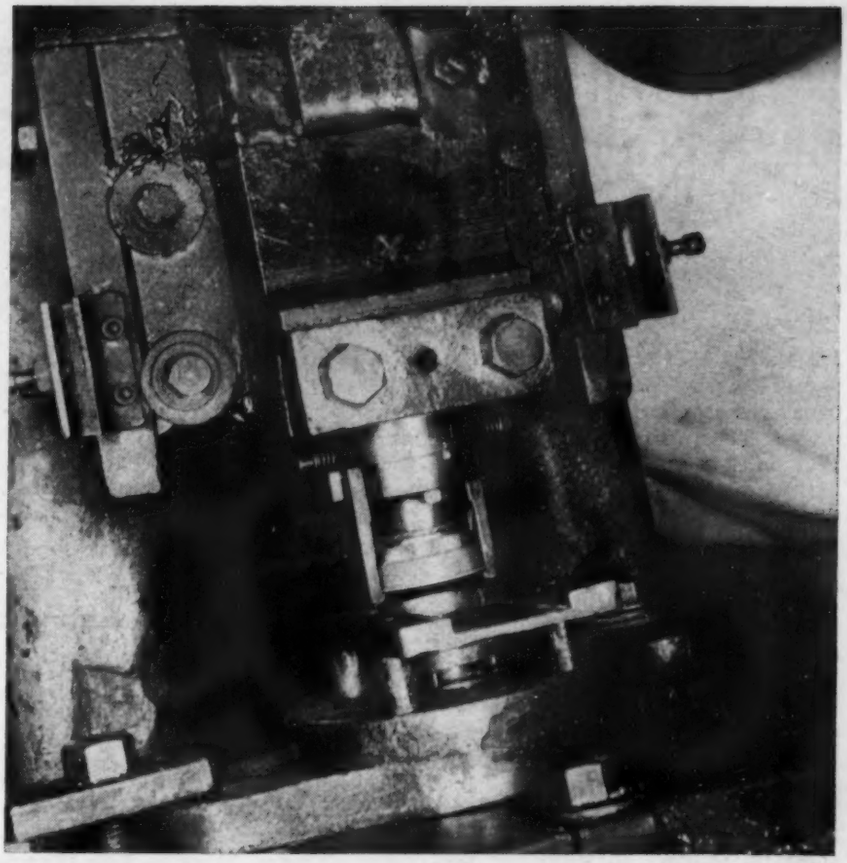




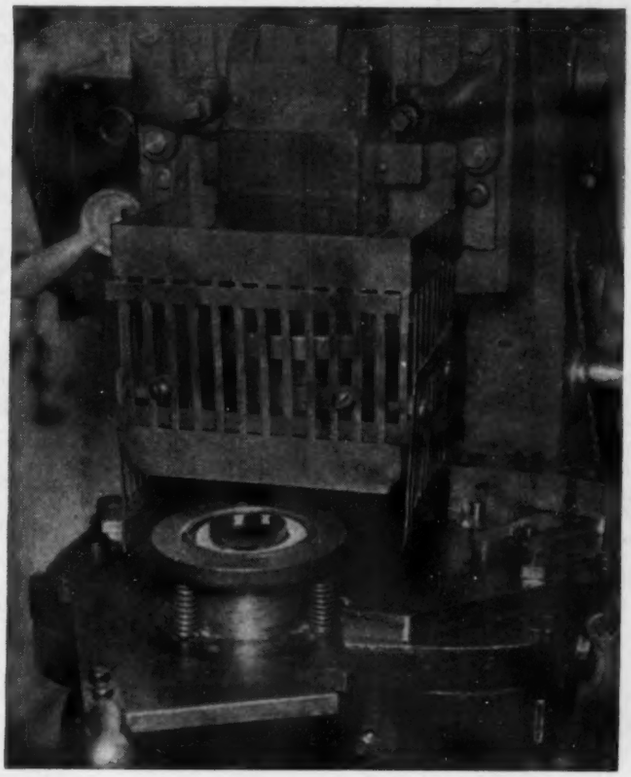
FEED CHUTES can be provided in many cases even when clearance between punch and die is limited. This die set (upper left) is used for an expanding operation on a drawn cup and the guide arms have been provided so it can be completely enclosed. Pins to operate the chute sides are mounted in front of the die. Conical points of these pins contact hardened cam blocks connected to pivoted ends of the chute guides. In the open position there is only 5/16-in. clearance between the bottom of the punch and the top of the swinging guide arms; therefore, cam blocks are located close to pivot points of swinging arms to open them rapidly. When the guide arms are fully opened (upper right) they are held by spring-loaded ball detents so they will not swing closed until ram is almost at top of stroke at which time arms on the ejector bolts lift the balls slightly, releasing the arms. The guard (right) surrounds all moving parts. Openings permit feeding the part into the chute and observation of the operation. An air-blast nozzle in front of the chute insures proper movement of the piece into and out of the working area

reaches the bottom of the stroke, the ram is brought to a quick stop.

Regular inspection and maintenance of presses and guards should be provided to insure efficient, safe operation. Before any work is done on a die in the press, or before starting to change dies, power should be disconnected and the flywheel of the press positively stopped. When a bar is used in the crankshaft or flywheel to turn either by hand, it should be made so that it will fall to the floor as soon as it is released, if not removed properly.



CHUTE FEEDS frequently require that special ejecting devices be added to the die. Here, two spring-loaded fingers lift the cupped shell out of the die on the return stroke of the ram. Clearance is provided so the piece will fall out of the fingers and into a chute at the rear of the press when the part is raised above the feed-chute assembly on ejection



SWINGING DIES, principally used for assembly and riveting operations, make it unnecessary for the operator to place his hands in the danger area. Work can be loaded into the die when the die has been swung forward (upper left). When the die is returned to the working position (right) it is amply guarded with the device shown. When the swinging die plate has been moved forward to permit unloading and loading, a safety lock engages the trip lever to insure against operation of the press. This lock is operated by an arm which engages in one corner of the swinging plate. When in the closed position, the arm is turned sufficiently to permit a spring-loaded vertical pin to be pushed down into a hole in the arm. This permits downward motion of the trip lever to engage press clutch

RETIREMENT PLANS May Be Based on Profit Sharing

Company retirement plans may be based on profit-sharing instead of fixed periodic contributions. Here are details of the method

BY JOHN M. ZUBER
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TO MANY EXECUTIVES, the term "profit-sharing" denotes only a cash bonus or incentive-pay arrangement under which funds, bearing some relation to profits, are distributed periodically. There is considerable difference of opinion on the effectiveness of this "current" type of profit-sharing.

My purpose is to discuss an entirely different type, which might be called "deferred profit-sharing." Unfortunately, too few employers know of its advantages and how it differs from a "pension" plan as that term is used in the federal laws and regulations.

A pension plan, in order to meet federal qualifications, must be "actuarially sound." In substance that means that the employer must make certain annual contributions which will assure each eligible employee a stipulated dollar amount of pension at the time of retirement. Thus a pension plan is specific in its benefits and, once established, the employer's contributions are fixed without any relation to profits.

On the contrary, no actuarial requirements apply to a retirement plan based on profit-sharing in order for it to qualify under federal laws and regulations. Both the employer's contributions and the employees' retirement benefits are dependent upon profitable operation of the business.

Basic Elements

A number of fundamental elements in every profit-sharing retirement plan warrant brief comment:

1. The employer's contributions are based upon a formula which may apply to profits generally or only to a certain portion of the profits. Rarely do employees contribute.

2. Only those executives and workers participate who qualify under eligibility rules of the plan.

3. The employer's contributions under the plan are apportioned equitably among the participants without discrimination, usually in relation to salary or wages and often considering length of service.

4. Benefits are specified for participants who reach retirement age or who are disabled and for the families of those who die. Often some benefits flow to participants whose employment is otherwise terminated.

5. Usually a committee selected by the employer is given considerable authority and responsibility in carrying out the plan.

6. Bookkeeping, management of the retirement fund and other details generally are the responsibility of a competent trustee.

Advantages

There are several advantages of qualified retirement plans common to both the pension and the profit-sharing types. These include tax deductions to the employer and tax benefits to the participants. Further, employees tend to be more loyal because of provision for their old age, and younger men are assured of better opportunities for advancement because of the assured retirement of those older than they.

In addition to these general advantages, there are several other important reasons why many employers have established profit-sharing retirement plans. Some are:

1. The employer's contributions are based solely on a formula related to profits. Hence, in those years when the employer earns small profits or none at all, little or no contribution is required.

2. No serious difficulty arises in including elderly people at the time a profit-sharing retirement plan is established. (Many employers hesitate to create a retirement plan of the pension type because of the greater cost during the first several years if individuals nearing retirement age are included.)

3. Considerable flexibility can be obtained in profit-sharing retirement plans, and annuities, and methods of providing benefits to participants.

4. This type of retirement plan creates an incentive to increase the profits of the business. It tends to increase efficiency, improve production and sales, and lower costs.

5. A profit-sharing retirement plan can be coupled with a pension plan. This is usually done where the employer creates a modest pension plan and supplements it with a retirement plan based on profit-sharing.

Retirement plans based wholly or partly on profit-sharing are not best suited to all employers. On the contrary, many business concerns have or will rightly decide to adopt actuarial pension plans. Nevertheless, there are many other cases in which deferred profit-sharing may fit the situation better, and employers should be alert to its use.

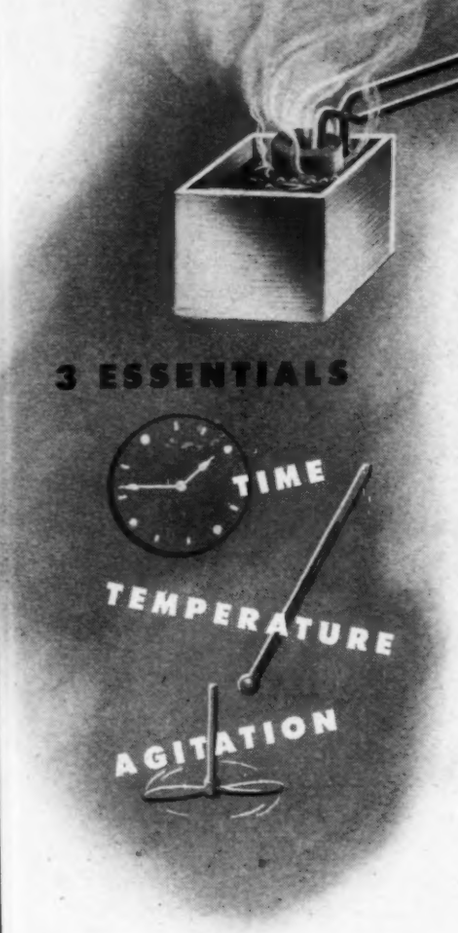
One additional word of caution. A retirement plan, whether profit-sharing or pension or a combination, is only as good as the employee believes it to be. Too many such plans have failed simply because the employer did not obtain or keep the employees' interest. It is essential that a plan be fully and adequately explained when it is first established, then reviewed periodically with present or potential participants, so they will be aware constantly of its merits.

EIGHTY-SEVEN PROFIT-SHARING PLANS ANALYZED IN REPORT OF SUBCOMMITTEE OF U. S. SENATE FINANCE COMMITTEE

	% of Companies Reporting Strikes	% Reporting Decrease In Turnover Following Adoption	% Reporting Increased Efficiency	% Reporting Increased Loyalty
Current Distribution	4.5%	41.8%	50.7%	68.7%
Deferred Distribution	0.0%	65.0%	55.0%	80.0%

Quenching

MEDIA AND METHODS



BY

HAROLD L. FLYNN,

ASSOCIATE EDITOR

Quenching practice some time ago passed the "dunking" stage. Modern steel research has clarified our knowledge of the hardening process and enabled the steel hardener to provide the best properties of steel for each particular application. The quenching stage is the point at which all previous operations are brought to a successful or unsatisfactory conclusion. Here the final quality of the product is determined.

Metallurgists, heat-treaters and management are now realizing that poor quenching methods can cut into profits and product reputation. There are available today many forms of heat-treating equipment, providing various means for heating the work, ingenious devices for continuous handling, well-designed quenching equipment and precision temperature control. With these tools the heat-treater can depend on accurate and reproducible control.

Time, temperature and agitation are the "big three" of correct and efficient quenching practice. Selection of the proper medium for quenching depends upon the characteristics of the metal itself and the required finished properties.

Brine, water, oil or other conventional media each possesses a definite cooling rate which can be increased by lowering the temperature of the bath, agitating or circulating the liquid, or by spraying in jet against the surface of the work. Interrupted quenches have far extended the utility of heat-treating.

The following outline of current media and methods is intended as a guide in steel-hardening practice.

A SPECIAL American Machinist REPORT TO THE METALWORKING INDUSTRIES

Quenching: STRUCTURAL CHANGES

STEEL, which is essentially an alloy of iron and carbon and various proportions of nickel, vanadium, chromium, molybdenum and other elements, attains required properties by the form in which these elements are distributed. Of all these elements, carbon exerts the greatest influence, and the form in which it is distributed in the steel determines the ultimate properties. The function of heat-treatment is to alter the form in which carbon is dispersed in a metal.

Alloys present in metal serve mainly to alter the rate at which the reactions occur which alter the form of carbon in heat-treatment. In themselves the alloys do not greatly affect the tensile properties of a steel which is properly heat-treated. They do, however, affect the rates of reaction and the maximum size of piece that can be handled in a practical manner.

Austenite First Step

In unhardened steel, at room temperature, carbon is present in the form of particles of iron carbide which are visible under a microscope. These preliminary structures, shown in accompanying photomicrographs, are known as pearlite and for obvious reasons spheroidite. When such steel is heated to an elevated temperature, between 1450 and 1500 F. the carbide dissolves in the surrounding iron, forming a solution of carbon in iron called austenite. This solid solution in the form of grains is the substance from which, by controlled quenching, microstructures having useful properties can be created. When the austenite is cooled, the carbide tends to separate again, but by controlling the cooling rate the pearlite and spheroidite structures can be avoided and a more versatile and useful structure developed.

If an austenite of say 0.80% carbon, is cooled from 1500 to 1200 F. and allowed to remain there until it transforms, it forms pearlite, which is quite soft, around 200 Brinell. If, however, the austenite form is cooled to around 600 F. and allowed to remain at this temperature until it transforms it forms to a structure called bainite, of about 550 Brinell. If the austenite is cooled to about 250 F. before transformation takes place the resultant structure is a martensite of 650 Brinell.

Transformation Imporant

All these reactions begin with austenite, and the structure finally attained at room temperature is determined by the temperature at which the transformation of austenite took place during the cooling from 1500 F. down to room temperature. The lower the temperature of this transformation, the harder the transformation product.

If a transformation product has formed from austenite at some temperature (for example, pearlite at 1200 F.) and is cooled to about 500 F. it would never form bainite, or if cooled to 200 F. it would not form martensite. Therefore, if it is desirable to form any particular transformation product, like bainite or martensite then the steel (austenite) must escape any transformation at a higher temperature.

Avoiding Pearlite

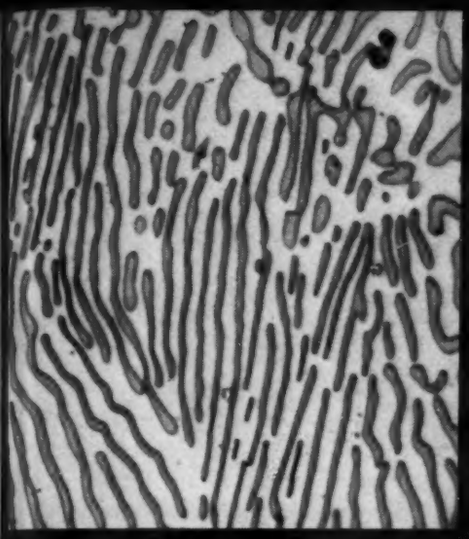
The shortest time for formation of pearlite is at about 1000 F., full transformation taking only 3 sec. To avoid pearlite, this 1000 F. zone must be traversed in less than 3 sec, preferably less than 1 sec. Speaking in terms of a cutting tool (0.80% carbon steel) being hardened by quenching it would need to be cooled at such a rate that its time in the 1000 F. zone would be less than 1 sec. Then only can it be hardened to bainite or martensite.

If, in cooling, the formation of pearlite is avoided, then bainite forms in the next lower temperature range, from 800 to 400 F. The steel should be cooled rapidly enough to avoid formation of pearlite and held at the desired temperature long enough to form bainite, the necessary rapidity of cooling varying with the steel.

Martensite, the hardest product of all (600 to 650 Brinell) forms when the austenite has been cooled to near room temperature without prior transformation. It forms quickly, and when the austenite reaches about 400 F. a small proportion, maybe 5% of martensite forms instantly, and as the temperature falls, additional increments of martensite form as each new temperature level is reached. The total proportion of martensite may be 50% at 300 F. and 95% when the steel has reached 200 F.

S-Curve Data Vital

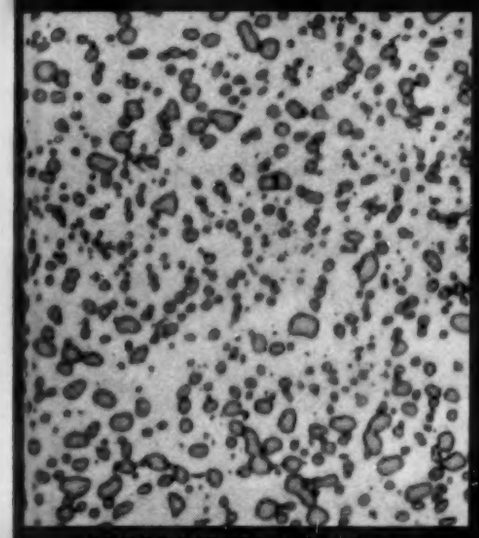
The various times for transformation of structures for various temperatures can be plotted in a diagram of time and temperature. Temperature is plotted vertically. At each temperature level at which the reaction is noted, time is plotted horizontally at a point representing the time required for transformation. Time units are arranged on a logarithmic scale, the short times being expanded and the long times compressed. These points, connected, give a curve, which by reason of its shape is



PEARLITE, X2500

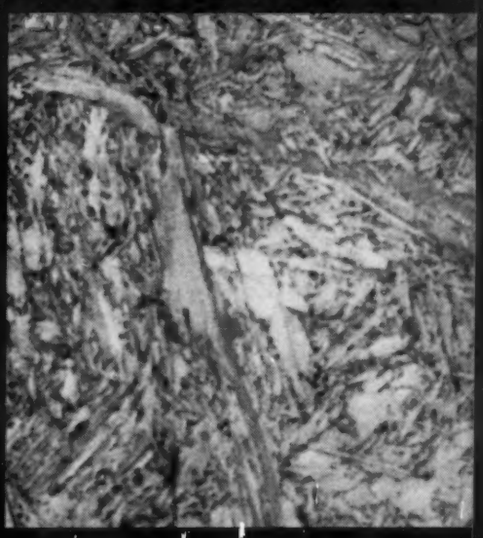
AUSTENITE, X500

BAINITE (complete), X2500



SPHEROIDITE, X1000

BAINITE, X2500



MARTENSITE, X2000

TYPICAL MICROSCOPIC STRUCTURES

Heat-treatment alters the form in which carbon is present in steel. In this 0.80% carbon steel, hardening is prevented if either the structures of pearlite and spheroidite are allowed to prevail. When the steel is heated to 1500 F., the carbide dissolves in the surrounding iron to form a solution of carbon in iron called austenite. If the austenite is cooled quickly to 600 F. by a suitable quenching method and held there it transforms to a structure called bainite. By cooling the austenite to 250 F. the structure that results is martensite, between 600 and 650 Brinell hardness

colloquially referred to as an S-curve, or more properly an isothermal transformation diagram. It is useful because it depicts the tendency of a steel to form various structures during the course of cooling to room temperature, or while being held at any temperature to which it may have been cooled. TTT—time-temperature-transformation — diagrams are now available for most steels.

The longer times for formation of pearlite become useful when it is necessary to harden larger sections. When small bars are quenched they cool so rapidly that there is very little formation of pearlite.

The mechanism of any quench is its cooling of the surface of the piece. The moment the surface is cooler than the inside heat begins to flow from the inside to the cooler surface and continues to flow as long as the outside is cooler than the inside. Severity of quench indicates solely how fast heat is extracted from the surface, the rest of the cooling operation being a question of heat flow within the piece. Rate of cooling of any particular piece being quenched is governed by the quench employed as well as the size of piece.

It must also be remembered that scale on a piece quenched is likely to interfere with the quench and produce inconstant cooling, especially if the quench is in oil.

In hardening, the effect of the size of piece on the rate of hardening has come to be fairly familiar, so that most heat treaters and metallurgists know how to select a proper hardenability of steel, which would be appropriate for the size of bar to be hardened. Possibly not quite so familiar is the variation in severity of quench under various conditions. Tables made up on this would be more tangible if they were stated in terms of sizes of bars which when quenched (using the same steel) attain the same hardness at the center of the piece.

Quenching MEDIA

GENERALLY, it is best to use the mildest quenching medium which will give the desired degree of hardness and tensile strength without producing excessive brittleness, cracking or warping. The first requirement of any quenching fluid is that it provides the desired cooling rate.

Adaptability of the medium depends on other factors such as low cost and general availability, permanency of cooling characteristics in continued use, maintenance of cooling characteristics with moderate temperature changes, ease of handling and safety.

Quenching Variables

Additional factors that affect the selection of the proper quenching medium are the method of quenching, nature of the metal to be quenched, size and shape of the part to be hardened and the physical characteristics desired in the hardened part. Of course, if it cannot provide the desired cooling rate it cannot be considered for any specific quenching application.

Quenchants most commonly used in heat-treating plants are water, brine solutions, oils and air and dilute sodium-hydroxide solutions. Increasing applications are being found for molten salts, molten metals and occasionally emulsions of soluble oils and water.

Water. Ordinary water is the cheapest and most available medium and is easy to handle in quenching tanks and piping systems. It finds widest use for quenching carbon steels ranging from 0.50 to as high as 1.20% carbon. Temperature of the water should not be over 100 F. at any time, as plain water loses cooling speed rapidly above this.

A still bath of fresh water is not a good quenching medium. It dissolves large quantities of gas from the atmosphere, and when a part is immersed in the bath, the boiling action throws this gas out of solution and it settles in the form of bubbles on the surface of the part, especially in holes or recesses. Non-uniform hardening results, evidenced by soft spots on the surface of the metal, and internal strains that are likely to crack or badly weaken parts.

When provisions are made for circulating water vigorously, for flush quenching or for maintaining the water bath at constant temperature, fresh water is a satisfactory quenching medium. Water baths at atmospheric temperatures provide cooling speeds somewhat below sodium-chloride brine, dilute sodium-hydroxide solutions and water sprays but greatly in excess of those of oils.

Brines. There is a growing tendency to substitute a 9% (by weight) sodium-chloride (common salt) brine for water as a general quenchant for steels of the water-hardening type. More uniform hardening can be obtained with brine and the presence of sodium chloride or calcium chloride prevents water from dissolving atmospheric gas. The brine takes hold and wets the part all over immediately so quenching can proceed uniformly.

Brine also seems to be able to crack away the insulating furnace scale cleanly and thus get right down to the metal surface immediately. The temperature of brine baths should be constantly maintained between 70 and 100 F.

Caustic-soda solution. Where quenching speeds higher than those provided by water baths are desired, dilute sodium-hydroxide solutions are used. Their cooling characteristics can be maintained without unusually close control of concentrations and they are better able to compensate for poor circulation. Cooling rates are less affected by temperature rise than those of water, and their vigorous action upon heated steels effectively removes scale and so tends to prevent soft spots.

Caustic-soda solutions are corrosive and are not as easy to handle as other fast-quenching fluids. Their cooling characteristics change with time because they absorb carbon dioxide from the air. This can be avoided by making up fresh solutions about once a week. Caustic-soda solutions usually contain from 2.5 to 16.5% of sodium hydroxide by weight, with 5% solution being most generally used.

Acid Baths Useful

Acids and Acid Solution. A cooling rate between that of oils and water is provided by concentrated sulphuric acid at 68 F. Change in acid concentrations from 10 to 20% has little effect upon the cooling rate, the resultant center or surface hardness, and microstructure of the part, especially when the part is high-carbon steel.

A 10% hydrochloric-acid solution gives the same cooling rate as 10% sulphuric-acid solution, but as the concentration is increased the cooling speeds in the hydrochloric acid solutions drop to lower values than those in sulphuric solution.

Oils. Many combinations of animal, mineral and vegetable oils have been tested as quenching oils, but mineral oils and mineral-oil blends have generally replaced the other types because of their stability and availability. Oil has a quenching rate that is less affected by changes in the bath temperature and is able to maintain a more uniform rate of quench over a broader range. It is used for hardening steel when water quenching would be too drastic.

Because the hardening of steel during quenching depends more on the first stages of cooling than the later approach to room temperature, oil possesses a distinct ad-

vantage over water and water solutions which furnish fast cooling rates at both high and low temperatures, the rapid cooling at low temperatures being the main cause of cracking and warping. Oils have the further advantage of improving slightly in quenching speed as their temperature rises.

Cooling power of quenching oils may be increased in several ways, the easiest by agitating the oil or the work in the oil. The addition of a small percentage of an animal oil, or a larger addition of a petroleum product from later stages of refining, increases the quenching power of straight mineral oils. Sufficient agitation of straight mineral oil will produce cooling rates nearly equal to those furnished by the "accelerated" quenching oils, despite agitation of the latter.

The usual slow-speed mineral quenching oils cool steel at 1500 F about 30% as fast as cold water, and high-speed mineral quenching oils reach a rate about 65% that of cold water. Each type of oil cools steel at 400 F. only about 10% as fast as cold water. The fast oils will harden types and sections of steels which will not harden effectively in the slower oils.

Viscosity of the oil should be approximately 100 to 150 Saybolt at 210 F. Speed of convection currents depends largely on the mobility or viscosity of the oil, and if an oil of relatively low viscosity (without undue increase in volatility or flash point) is used the turbulence of the mass of oil in the tank promotes efficient cooling of the steel. Pumping, circulation and cooling of the quenching oil are improved if the viscosity of the oil is not too high. A free-flowing quenching oil also results in less "carry-away," because the oil clings to the steel after cooling and removal from the quenching bath.

All quenching oils will ignite on continuous application of heat at the surface, but in quenching practice the steel at a temperature of about 1500 F. is immersed rapidly so the surface layer of the oil, in contact with the oxygen in the air, is not permitted to rise to the ignition temperature. Flash point should be about 360 to 380 F. and fire point 410 to 430 F. for safety.

For uniform results it is usually sufficient to keep the temperature of the bath within a range of 25 F. There are several ways in which the cooling may be done, the choice depending on the needs of the particular installation. A bath temperature of 110 to 120 F. is ideal for most work, with 90 F. as the lower and 150 F. as the upper limit.

The addition of 5% neutral lard oil has been found to be a satisfactory quenching medium for oil-hardening tool steel and high-speed steels, increasing the wetting characteristics and giving a better uniformity of surface hardness.

Air. Air hardening is resorted to occasionally when the degree of

COOLING POWER AND PROPERTIES OF VARIOUS OILS*

Quenching Medium	Cooling Rate Relative to Water	Sp. gr. at 60°F.	Flash Point, °F.	Fire Point, °F.	Approx. Viscosity at 100° F. Saybolt Universal
Prepared[1] oil No. 1	0.44	0.862	365	405	110
Prepared[1] oil No. 2	0.35	0.874	375	415	110
Transformer oil	0.17	0.869	311	360	75
Machine oil	0.22	0.909	405	464	250
Paraffin oil	0.29	0.879	325	370	...
Fuel oil	0.36	0.856	205	219	...
Palm oil	0.15	.....	435	486	220
Rapeseed oil	0.22	0.874	379	444	250
Castor oil	0.29	0.963	565	640	1500
Cottonseed oil	0.36	0.925	610	680	175
Olive oil	0.37	0.917	590	680	200
Lard oil	0.19	0.917	565	685	180-200
Fish oil	0.31	0.933	401	446	130
Sperm oil	0.33	0.885	500	581	110
Neatsfoot oil	0.33	0.922	500	621	230-270
100% A[2]	0.26	0.864	360	410	65
95% A + 5% B[3]	0.39	.....	...	...	...
90% A + 10% B	0.41	.....	...	...	...
85% A + 15% B	0.42	.....	...	...	...
60% A + 40% B	0.35	.....	...	...	...
30% A + 70% B	0.32	.....	...	...	...
100% B	0.29	0.897	534	610	1200

**Cooling power is measured by the cooling rate of a ½ in. dia. cylinder of 1% C steel when it has cooled to 1328°F. from 1607°F. while in still oil. Values of cooling rate are relative to that for quenching in still water which is 356°F./sec. = 1.00*

[1]These are oils with a mineral base and contain 3.3% fatty acid.

[2]Pa. pale neutral oil—viscosity 65 at 100°F. (Saybolt)—flash point 360°F.

[3]Pa. heavy residuum crude oil, steam refined—viscosity 1200 at 100°F. (Saybolt)—flash point 534°F.

STANDARD TESTS FOR OIL

WHICH ARE SIGNIFICANT WITH RESPECT TO ITS QUENCHING BEHAVIOR

TEST	A.S.T.M. STANDARD METHOD NUMBER
Specific gravity	D158-28
Viscosity	D88 -36
Flash point	D92 -33
Fire point	D92 -33
Pour test	D97 -34
Carbon residue	D189-36
Steam emulsion	D157-36
Saponification number	D94 -36

distortion is objectionable. The part to be hardened should be suspended in still-air quenching or placed on a screen so air can circulate freely past it. Fans or compressed air are used for accelerated air cooling and compressed-air lines should be carefully checked to see that they are free of moisture.

Molten Baths. Molten niter baths, ordinarily used for tempering, with a melting point of approximately 325 F., are useful in quenching intricate tools and dies of certain oil-hardening steels, in which it is necessary to maintain close dimensional tolerances or the part has a combination of light and heavy sections. Oil-hardening tool steels having an analysis of carbon, 0.95%, manganese 1.20%, chromium 0.50%, tungsten 0.50%, vanadium 0.20% reach full hardness when quenched from 1475 F. into a molten niter bath at 400 F., then into oil as soon as the temperature is equalized. The amount of distortion with this method is about one-half that of a direct-oil quench. Molten niter baths are not recommended for steels requiring a quenching temperature over 1700 F.

Molten lead baths are often used for quenching high-speed steels of hazardous shape because of sharp re-entrant angles or adjoining light and heavy sections. Many such tools have been safely hardened by quenching from 2300 to 2350 F., holding in the lead bath until the part has uniformly assumed the temperature of the bath, and then quenching in oil or even air cooling. The cooling rate of the molten lead is sufficiently rapid in the range between 1300 and 900 F. and full hardness is obtained even though the tool may be held in the lead bath up to an hour. Tools quenched in this manner must still be tempered by conventional methods.

If for any reason it becomes necessary to anneal and reharden tools that have been quenched in a lead bath, it is essential that any adhering particles of metal be removed before the steel is reheated above 1400 F. or the surface will be pitted by clinging lead particles.

Quenching METHODS

WATER, which provides the fastest cooling rate, is suitable as a quenching medium for carbon and low-alloy steels, or shallow-hardening steels. Water quenching can be used under conditions:

1. Where irregular quenching as a result of temperature changes is not important.
2. Where the steel demands drastic quenching attainable with cold-water or salt solutions.
3. Where rapid cooling at the lower temperatures does not cause rupturing or cracking.
4. Where hardness is more important than toughness and superior structure.

Oil quenching is generally used for moderately or highly alloyed steels to attain full martensitic hardness with minimum distortion.

The final cooling stage in an oil bath sets in at a higher temperature than water and is only about half that of water. Residual stresses which favor cracking and warping are much lower.

Work Condition. Scale on the part hinders heat transfer from the metal to the quenching medium and causes incomplete hardening. The effect is less pronounced in water quenching than in oil quenching because violence of steam formation is usually enough to throw the scale from the surface.

Hardening Retarded

Vapor formation in oil quenching does not always take place with enough force to throw off scale and heat extraction may be retarded so that no appreciable hardening takes place. This is most likely to occur in the quenching of carbon steels, with their high critical cooling rates.

For oil quenching, the heating conditions should be regulated to keep scale at an absolute minimum. Smooth surfaces cool faster than rough surfaces because gas-bubble formation is retarded.

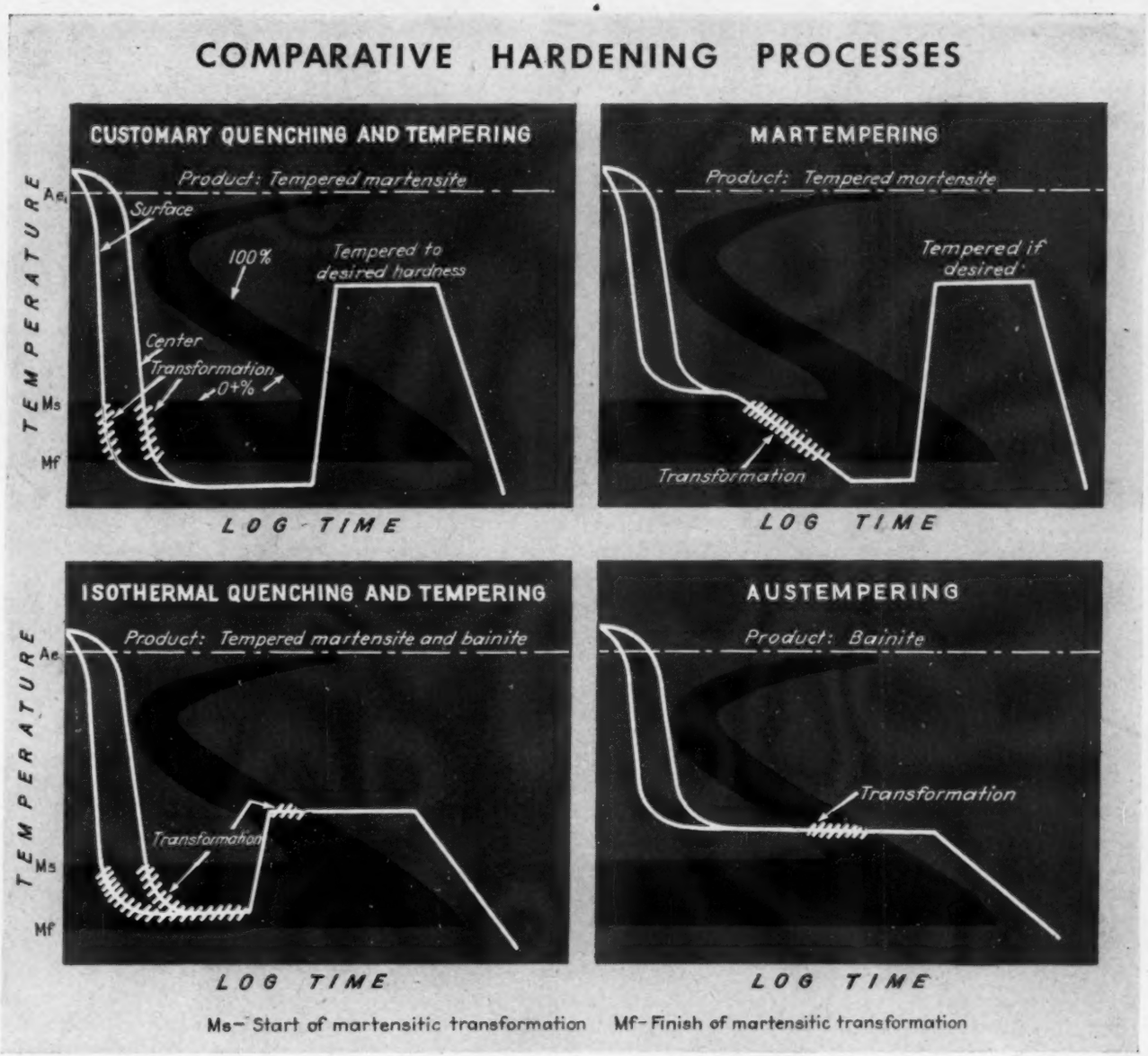
Bath Temperature. Increases in temperature of the quenching medium lowers cooling rate and reduces hardness of the quenched steel. In water and brine, the change in cooling rate is small for temperature variations below 100 F. Near the boiling point the cooling rate is low because of low-conductivity vapor in contact with the steel. Water baths should be kept below 70 F. for the best results.

Oil-bath temperatures are extremely important when quenching tanks are small or where circulation of the oil is not adequate. More reproducible results are obtained if the bath temperatures can be held under a spread of 25 F.

Media Quantity. A safe figure for quantity of quenching medium to be used in oil quenching is 1 gal. of oil for each lb. of steel quenched per hour. If separate oil coolers or circulating pumps are used a lesser quantity will be sufficient. However it is better to have too much than not enough and will guarantee more uniform hardening results.

Water-quenching temperatures being usually lower than those of oil quenches the same rule may be followed for determining size of water-quenching tanks, in spite of the higher specific heat of water as compared with oil.

Bath Agitation. In the old days when all quenching operations were carried out by hand, there must have been a keen realization of the effectiveness of agitation, because in those days it was quite common practice to move the piece about in the quenching medium,



Conventional quench and temper methods avoid the "S" curve, being quenched directly from austenizing temperature to approximate room temperature followed by a prolonged draw, giving a tempered martensite. In martempering, the work is brought to a point just above the martensitic transformation range and held there just long enough to equalize the temperature throughout the section but not long enough to cause bainite formation. The work is then air-cooled to room temperature. Austempering, on the other hand, consists of quenching the work into a bath held at a selected temperature above that at which martensite forms and held long enough to permit transformation of austenite into bainite. Further modification of the physical properties of metal, whether austempered or martempered, may be procured by a tempering operation following the quench. In all of the isothermal treatments, center and surface of the work go through the transformation at equable rates, preventing unnecessary stresses and loss of toughness and making possible constant results in a wide variety of work

sometimes quite vigorously. Especially good was the "figure 8" motion, or a round-and-round movement which was not so rapid as to create a void in the wake of the piece. Such methods approach the ideal in which the piece is slowly rotated in a strong stream of coolant. In the course of mechanization of heat-treatment in the past 5 to 15 years perhaps too little attention has been paid to adequate circulation.

Good mechanical agitation has been well supplied in certain instances, as in spray quenches on plates and hardened rolls, and directed quenches as in Gleason and Hannifin presses. Mild forms of circulation, such as that provided by the convention currents or by the gentle flow of oil in the tank, have been found to be wholly inadequate to take full advantage of the hardening elements in carbon and low-alloy steels or utilize the inherent cooling power of the oil.

Full advantage of the cooling power of oil can be taken by us-

ing such devices as jets, propellers and pumps causing high-velocity flow. Pieces being treated are rarely of simple shape so it is desirable to control direction and location of impingement of the oil. Agitation is particularly desirable for hardening surfaces of parts.

Eliminate Vapor

Agitation, if severe enough, can eliminate the vapor or steam jacket formed when the hot steel is first immersed in the water. Continued agitation supplies fluid to the surface of the piece and helps release the gases from or formed by the quenching fluid at the surface of the metal, and prevents local heating of the bath in the vicinity of the metal. As a result it eliminates soft spots and promotes better uniformity than quenching in still water.

Immersion Methods. A number of methods of putting the part into the quench present themselves when any job is projected. The part may be hand-quenched as when the piece is plunged into the bath. Gravity quenching is where the piece falls freely through the bath. Mechanical conveyors may also be used and the movement of the piece through the bath is controlled. The piece may also be clamped in a rigid fixture to minimize distortion, as in fixture or flush quenching. The work is sometimes flooded by air or liquids from nozzles at high velocity.

Stable Heat Range

Whatever type of immersion is used, it is important to maintain the quenching medium in a relatively narrow temperature range to avoid variations in results. Timing in the quench must be uniformly the same for all like sections or a variation will exist in the quenched structure and carry through to the tempering operation, which will account for differences in hardness and physical properties within one piece or from one piece to another within the same heat.

Piece Size. Pieces of simple shape and fair size can be quenched directly in the appropriate medium, with moderate agitation. On a production basis, or with large parts, it is sometimes advisable to utilize sprays or pumps to flush the water or oil around the part. This can be done by manifolds in the quenching tank with outlets placed so a substantial flow is continually directed against the piece being quenched. As the size of the part increases, the cooling rate increases. This is not so pronounced for fast-quenching oils which suggest that these oils are particularly useful for quenching heavy sections.

Interrupted Quenches

Austempering. This is one of the methods developed during recent years which has come to be used widely in industrial practice. Austempering so far has achieved its greatest popularity in the plain carbon steels and the structural steels of relatively lower alloy content, and generally is applied to relatively light sections, less than ½ in. thick. It calls for quenching from a temperature range of about 1500 F. into a liquid medium at around 650 F. and holding it there for about 15 to 45 min., depending on the steel and temperature of transformation, so as to complete the transformation to the bainitic structure. There is no evidence of pearlite or martensite in this structure. Austempered articles exhibit a particularly useful combination of hardness and toughness, in that their hardness approaches that obtained at the lower tempering temperatures while at the same time exhibiting the toughness generally shown when the tempering temperature is in the higher ranges.

Martempering. This method calls for quenching from a high temperature into another medium, either an oil or a salt bath, at a temperature of 350-450 F., whereby the steel develops a completely martensitic structure, combining maximum hardness with comparative freedom from cracking and distortion and is best suited for intricate, large or precision tools.

High Quality Necessary

Quality of quenching medium plays a significant and deciding part since it has to remove the heat from the work and at the same time show no marked increase in its own temperature. Often it is necessary to maintain the temperature of the quenching medium within plus or minus 10 F. Control of the temperature of the quenching medium must be of a high order to obtain the uniform

We Acknowledge

Information contributed by the following companies made possible the preparation of this report:

Ajax Electric Co. Inc.
American Gas Furnace Company
American Society for Metals
Bell & Gossett Co.
G. S. Blakeslee & Co.
Carnegie-Illinois Steel Corp.
Carpenter Steel Company
Cities Service Oil Company
E. I. duPont de Nemours Inc.
The Esso Marketers
Fiske Brothers Refining Co.
Gleason Works
Gulf Oil Company
Hannifin Manufacturing Company
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Lindberg Engineering Company
Park Chemical Company
Pure Oil Company
W. S. Rockwell Company
Shell Petroleum Corporation
Socony-Vacuum Oil Company
Standard Oil Co. of California
Standard Oil Co. of Indiana
D. A. Stuart Oil Company, Ltd.
Sun Oil Company
Swan-Finch Oil Corporation
Texas Company
Tidewater Associated Oil Co.
Upton Electric Furnace Division

results inherent in both austempering and martempering.

The temperature of the salt bath should be slightly above the temperature at which martensite begins to form, around 400 F., a figure which varies somewhat with different steels.

Added Usefulness

The austempering and martempering process is gradually replacing much of the conventional quench and temperature procedures. Some of the products now being commercially produced include ball and socket joints, wrenches and pliers, gears, automobile bumpers, cast-iron cylinder sleeves, springs, large taps and dies, milling cutters, die blocks, revolver parts, business machine parts, shafts, tubular products and many others.

However it will not supersede conventional methods for all conditions. One of its main advantages is that the data available in "S" curves make it possible for the heat treater to predict the result he may expect to obtain when certain properties are to be developed that are unattainable by conventional methods. The isothermal method provides means for producing tougher, more ductile products that can otherwise be produced in steel at the same hardness. Thus, consideration is given for types of work where it is important to reduce processing time and inventory.

Surface-Hardened Steels. High hardness and wear resistance in case-hardened steels require a good quench which is suitable for the analysis, size and design of the part. Water is used for carbon steels except in small sizes, while oil is used for cooling alloy steels except in larger size and lower alloy contents. In oil quenching, heat loss is slow below 400-500 F., unless the parts are small and oil-quenched work becomes almost self-drawn by the time it reaches room temperature.

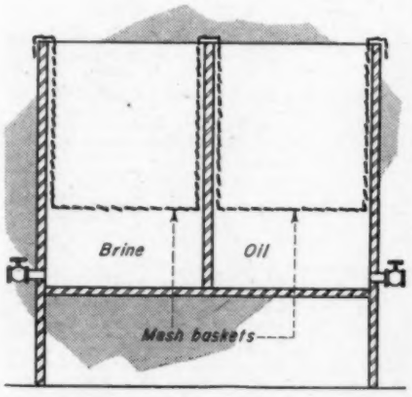
Cyanided steels may be quenched in either brine or oil, depending on service requirements and steel composition. Mineral oils are preferred for oil quenching rather than a blended mineral oil because fatty matter in the animal oil will saponify with the decomposition product of the cyanide bath, forming a hard soap that retards quenching speed of the oil. Such oils are available under tradenames.

Quenching EQUIPMENT

DURING recent years, quenching equipment has been receiving more attention from both user and manufacturer. Better control of temperature of quenching media has also been made possible. Types of equipment are determined by the type and amount of hardening required.

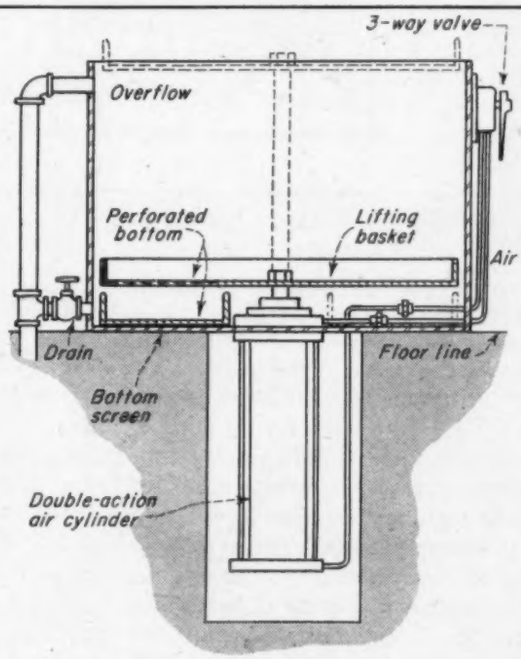
Continuous Quenching. This type of quenching equipment is useful for production hardening where units of work move through furnaces, and are discharged to a quench tank. From there the pieces are carried out of the bath by belt-type conveyors, in some cases being carried directly to a tempering furnace or else discharged to tote boxes.

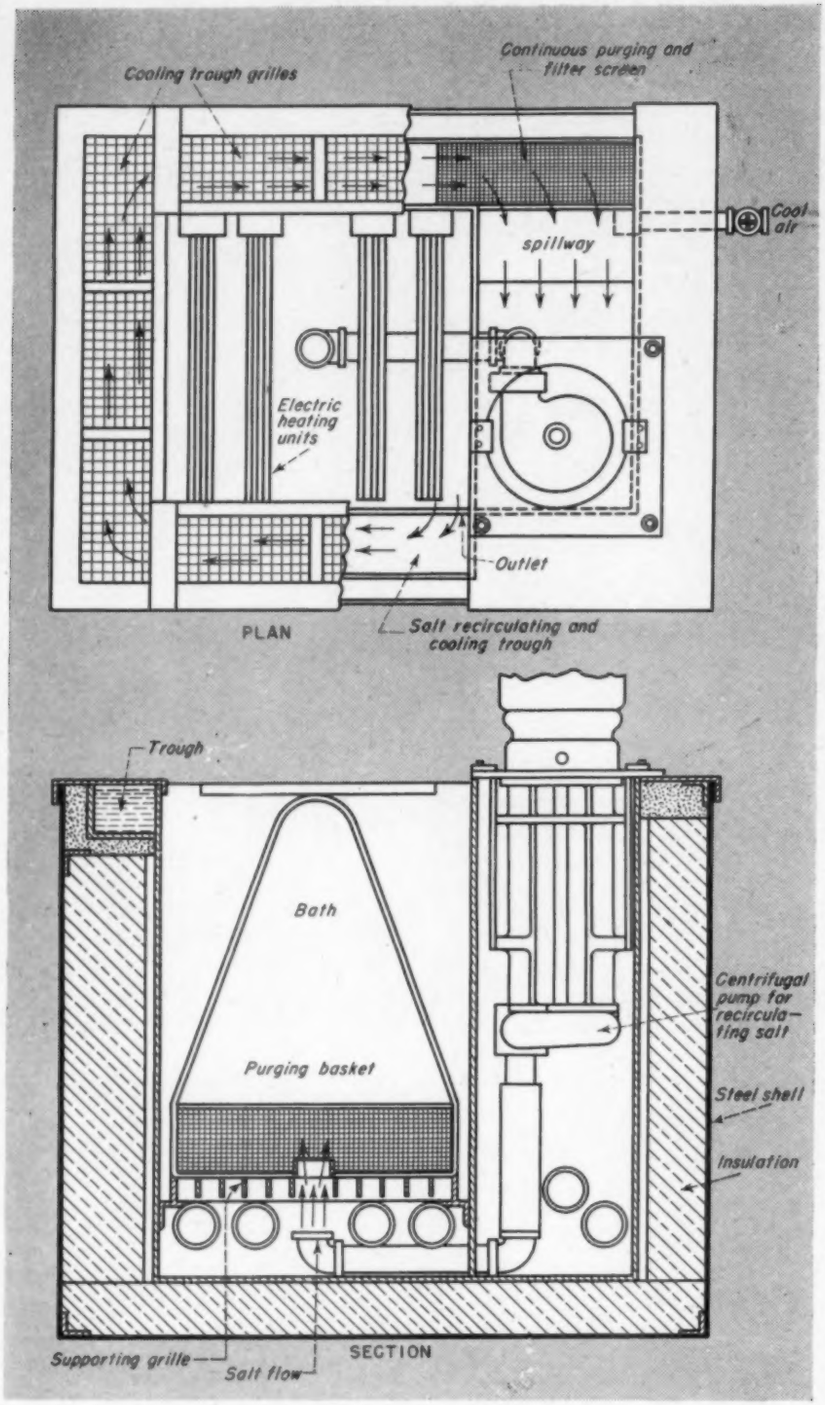
Batch Quenching. Batch-type



COMPACT QUENCH TANK *suitable for small tool and die shops can be made of 1/16-in. rolled and welded steel shell. A welded partition across the diameter enables half the tank to be used for water or brine and the other half for oil. Suitable wire-mesh baskets fit each half and are suspended by clips*

DRAINING *and cleaning is facilitated in this production-type quench tank. An air cylinder raises and lowers the perforated work basket and eliminates overhead lifting tackle. A 3-way valve enables work to be raised or lowered quickly or slowly and stopped at any level. Pieces that are too heavy to agitate manually can be alternately raised and lowered quickly to provide agitation*





ISOTHERMAL QUENCHING PROCESSES *are facilitated by a marquenching unit where the medium, oil or salt, is agitated and circulated by a pump and temper is controlled within 10 F. Recirculation and screening through troughs and spillways keeps the quenching medium free of contamination and an air blast helps maintain uniform temperature*

furnaces, used widely in shops for intermittent or low-run heat-treating, may be served by unit quenching tanks equipped with metal baskets for holding the work. The pieces to be quenched may be introduced to the quench either individually or in a batch, although they are usually removed from the quench in a batch.

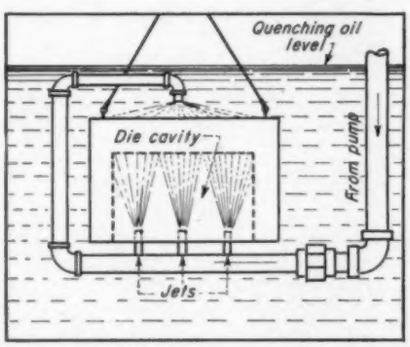
In many furnaces, provision is made for dropping the heated piece into the bath from the muffle without allowing it to come into contact with the atmosphere.

Flush Quenching. Parts, such as dies, which often have to be hardened locally or have recesses, can best be handled by fixtures. Water under pressure may be introduced to an appropriate point in the fixture and carried over the portion of the part to be hardened. Pressures of up to 50 psi. have been used, but for most precision work pressures of 15 to 25 psi. are preferable. Pumps may also be used to deliver brine or oil through the part.

Quenching Presses. Gears, rings and other circular parts can be hardened without distortion in quenching presses which hold and quench these parts. In one type the part is clamped between upper and lower dies for the quench, and a controlled volume of oil is circulated through the part. Pumping system and oil reservoir is built in and rate of oil flow through the die is around 225 gpm.

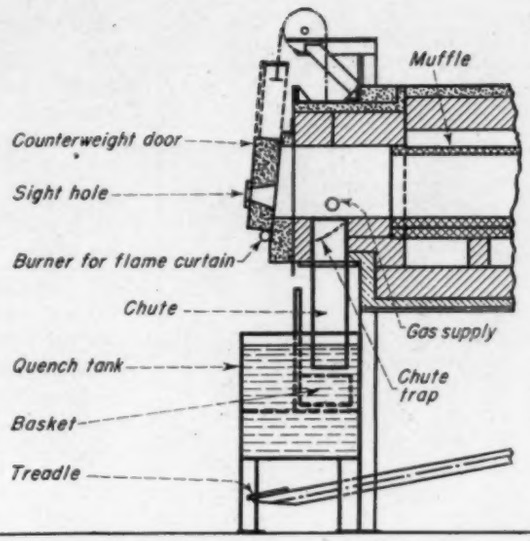
The upper die descends rapidly until it approaches the work, when it is automatically slowed down so it contacts the hot work gently. After engagement, full pressure is applied so the work is mechanically aligned while still in the plastic state. The work is free to contact in the normal manner but is always held true.

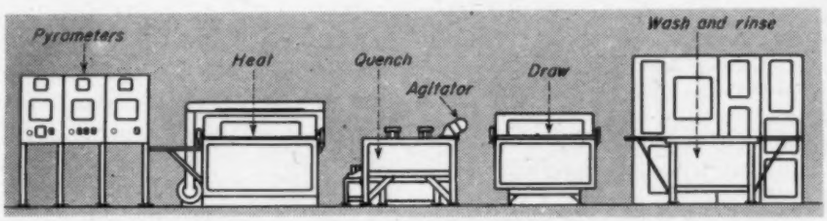
Control of the volume of flow at all times is possible. A piece may be given a fast, drastic quench



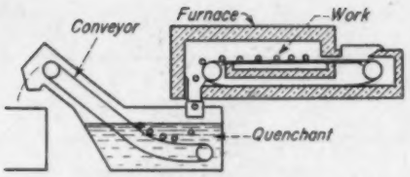
MOLDS AND DIES *having recesses can be adequately quenched by using a manifold with 3 or 4 openings and forcing oil through them under pressure. Every part of the cavity or recess is reached. To minimize distortion causes by rapid interior cooling, another oil line discharges under pressure to the outside of the mold. The mold may be tilted to vent gases*

OXIDE *formation on work in transit to bath is prevented by a lever-operated trap door and chute feed to a quench tank located suitably. Perforated baskets are located on a rack below the quench level for easy work removal*

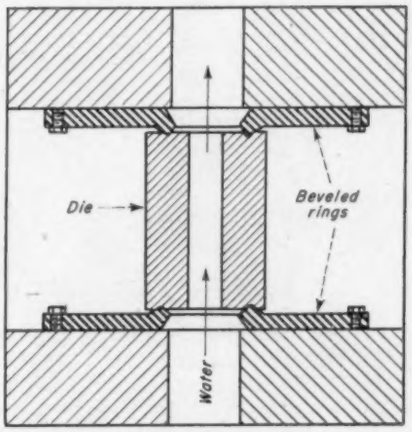




SALT-BATH EQUIPMENT *may be used in three steps for batch treatment of work. Here the salts are used for heating to 1550 F., held 10 to 12 min., the work then going to a salt bath quench at 625 to 725 F., holding not less than 1.66 min. (for SAE 4140 steel), and then being transferred immediately to a salt bath at 950 to 1050 F. for drawing. Cooling is by air, and cooling rate maintained by mechanical agitation*



HEAT-TREATED *work may be introduced to quench tanks without contact with air and on a production basis. A motor-operated conveyor belt, typical of modern production setups, removes the work from the bath at a predetermined rate either to tote boxes or directly to further processing units*

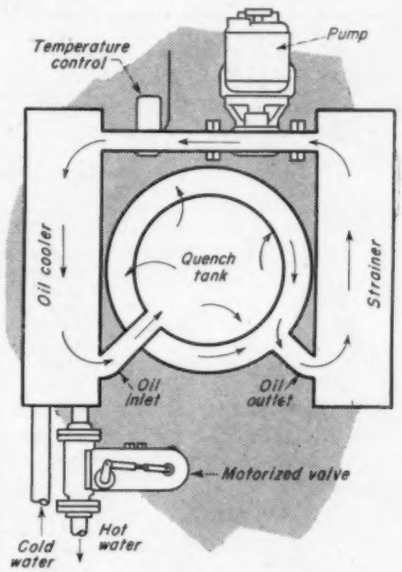


SELECTIVE QUENCHES *in the hole of heating and draw dies are provided by flush-quenching fixtures, one type of which consists of a base, ram air cylinder. High-speed steel beveled rings provide a water-tight seal effectively to localize the hardening*

until the critical point of the hardening temperature is passed, followed by a slow quench to allow the temperatures on the outside surface and at the center of the section of the part to equalize and to cool the material without internal stress and finally a rapid-cooling quench to bring the job down to the point at which the operator can handle it.

Another type of quenching press employs a centrifugal action with the part placed on the lower fixture, which is surrounded by a circular quenching chamber which opens in two parts with the fixture, and when closed provides a circular vessel for the quenching fluid. When closed, the entire assembly of quenching chamber, holding fixture and hot part is rotated by a motor drive.

Cooling Systems. Methods of cooling the quenching medium may vary from natural heat dissipation, which is possible when the ratio of oil to steel to be quenched is rather high, circulation of the



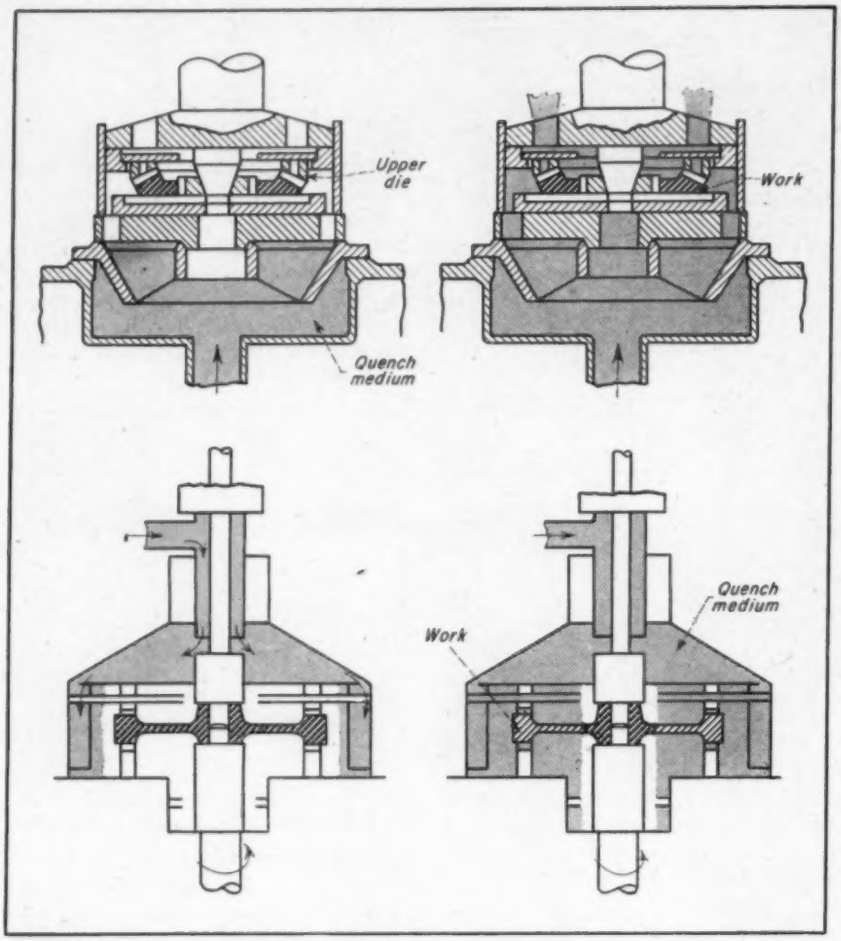
SELF-CONTAINED *quenching units, suitable for small to medium-sized operations, can handle 40 to 60 lb. of work per hr. in a continuous quench. Temperature and rate of agitation is controlled for peak uniformity. Temperature of cooling water is controlled by a thermostat which actuates a motorized valve which admits required flow of water*

oil through a radiator or coil which is cooled by air, water or chilled brine, or circulation of water or chilled brine through a coil immersed in the quenching bath.

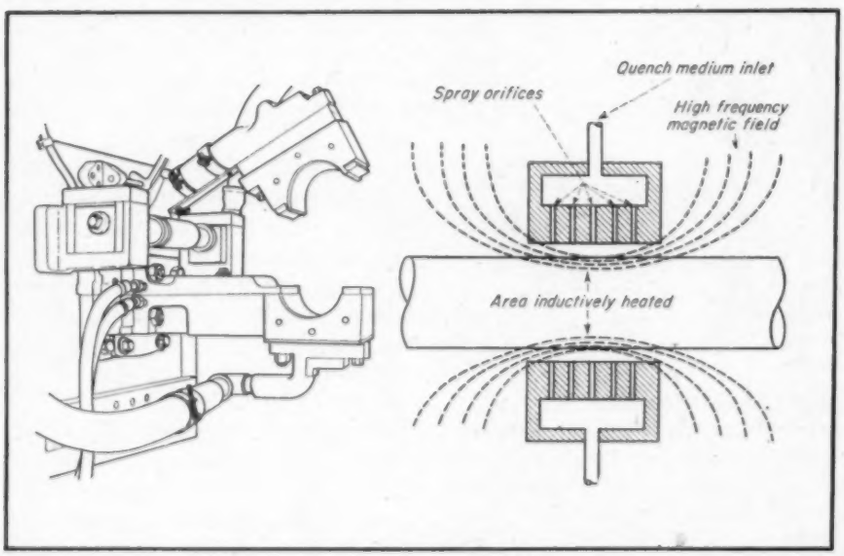
Best control of results is obtained when the oil in the tank itself is circulated for then cooled oil is continually brought into contact with the hot metal and the heated oil is carried away, aiding uniformity of quench.

Cooling of the circulated oil by means of a radiator or coils immersed in chilled brine is the best method where the cost of such an installation can be justified by the size of operations. The brine is cooled in a regular refrigeration plant and is circulated around the coils carrying the oil.

Compact unit systems are avail-



GEARS, CAMS, SPROCKETS *and other circular parts are most efficiently quenched by the use of aligning presses. Two types are shown here, the lower type being centrifugal in action. The upper die contacts the work while it is in the plastic state. Time cycle begins when the medium for quenching is forced into the chamber surrounding the work*



INDUCTION HEATING OF LOCAL POINTS, *as the bearing areas on this shaft, utilizes a quenching medium which is instantly supplied under pressure in the form of a spray*

able today for smaller jobs, which include a cooler with a copper coil housed in a shell through which city water is circulated, a circulating pump, strainer and automatic temperature regulator. The temperature regulator governs entry of cold water into the cooler in accordance with the degree of cooling required and is operated by a thermostatic control installed in the oil return line.

In any procedure for cooling oils or quenchants, precautions should be taken to avoid unwanted water. According to recent research it was shown that when an oil-in-water emulsion is used for quenching steel the cooling rate through the transformation zone is slower than the cooling rate of either oil or water alone. Only a few tenths of one per cent of water finely dispersed in a normally fast oil reduced the initial quenching speed so much that the oil no longer quenched satisfactorily.

At about one percent water concentration the quenching speed certain commercial oil approaches that of uncompounded low viscosity mineral oil. The effect is to prolong the vapor cooling stage and thus decrease the oil's initial quenching speed.

Size of Tank. Volume of quenching oil to be used and the size of the tank depends on the size, weight and number of pieces to be quenched per hour and the method of cooling the bath. A tank should be sufficient size to handle with ease the largest pieces to be treated and leave a generous allowance for circulation of the quenching oil. The tank must of course be designed to handle the full working capacity of the plant, and it is more desirable to have the tank too large than too small. Where means are provided for cooling the bath, good practice is to use 15 lb. of oil for each pound of steel quenched per hour. For uncooled baths, the ratio of steel quenched per hour should be higher.

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TALKING SHOP

Unguentine Works

UNGUENTINE, which we buy by the tube to soothe burns, is sold by the barrel in Detroit—to soothe dies. Makers of lithographed signs and advertising novelties have used it for years to lubricate dies for drawing fancy boxes, container and trays. Now automotive plants have taken it up for drawing lithographed sheets into garnish moldings and instrument panels. Such parts are printed in the flat, then formed in steel dies. Unguentine prevents the paint skin from cracking, we're told, just as it prevents your skin from doing the same thing.

Pushbutton Contraptions

ELABORATE automatic tools are given credit for serious trouble in one Detroit engine plant. Reasons: Too many buttons and complications. Trouble with maintenance. Poor interlocking, so trouble is caused by pushing buttons in incorrect sequence. Faulty remote solenoid controls for valves.

A basic trouble is, of course, the progressive line, with single high-production units for certain operations. When one machine acts up, the whole line is jammed. Apparently there was sense in Ford's rule of 20 years ago that no fewer than four machines do the same job on each Model T part. When one went down, production loss was only 25%.

Rivetless Brake Bands

HEAT-RESISTANT Bakelite resins are being used to bond brake linings to shoes. This eliminates rivet holes and scoring of drums by rivets, increases braking surface 15%, increases life 67%, and gives faster braking. Most of the lining can be used, instead of only the 60% which projects above the rivet heads.

Letter of Law

ONE PART ¼x2x10 in., with the holes, is made in pairs in one plant. Recently, Inspection turned down some hundreds of parts because they were 1/16 in. narrow—a result of use of available material. Strip that could be gotten was too narrow, so the piece had been drawn over in the die when punched. The production head, knowing the piece and how it was used, insisted the parts would cause no trouble, either in use or replacement. Engineering finally yielded and permitted their use—preventing delay of a $50,000 shipment and scrapping of several hundred dollars worth of parts. Now they've standardized on the narrower part—and available strip.

Stamped Citizens

"DO YOU CONSIDER customers and workers as units in a column of figures, or as people with all the variations of tastes and habits that human nature encompasses? In other words, do you treat people as if they were all stamped from identical dies in a punch press?"

There's a vital question from a practical shop man. He quotes two examples of better methods. One is the ex-officer who takes operators to assembly to see how parts are used. Another is the installation of a parts board outside the production control office, with every part being made mounted on it. Part numbers are thus replaced by a picture.

Butter Substitute

SPEAKING of silicones, another one, called Pan Glaze, is now used by bakers to replace the pan greasing that prevents bread from sticking. Molders of plastic and rubber goods now spray (2-4 psi. fluid pressure, 10-15 psi. nozzle pressure), dip or brush on the same stuff, for the same reason. A short air dry, followed by baking at 450 F. for an hour, hardens the film. Coatings can be taken off by 15-min. boiling in 2% trisodium phosphate.

The same stuff is used to coat ovens, stoves, hot-air ducts and stacks in these plants.

Dollars Win Attention

A CONSULTANT reports his first "cost-saving" job was in a department store. After five unbeatable brainstorms—presented in as many long, detailed reports—had gotten nowhere, he was worried. In his sixth report he emphasized the *money saving* possible, and in the first paragraph. The idea was okayed at once—and the Boss added, "Next time, give me savings in the first sentence." Nowadays, all his reports begin, "Annual estimated savings are . . ." He knows that management's prime interest is to detour dollars from the drain.

Silicones Again

SILICONE mold-release emulsion 35 is a water-white fluid which forms a parting surface between metal dies or molds and work pieces of plastics or synthetic rubber. It stands high temperatures (flashes at 625 F.), wets and adheres to metal surfaces, but doesn't combine with organic materials. Further, it does not carbonize or build up a deposit, claims Dow-Corning.

Nash-Kelvinator has found another advantage. When used as a mold coating in molding white polystyrene, it gives a smoother, more lustrous finish than zinc stearate. It also shortens the "smooth-off" period for new dies—requiring the waste of only tens instead of the usual hundreds of pieces before amorphous metal is scoured off.

Methods and Tooling Geared for Change

Fisher Body-Ternstedt Division's wartime experience with a broadly powered Tool Conservation Committee was so successful that the group now actively functions to cut costs and improve quality of peacetime products

BY CHESTER S. RICKER, DETROIT EDITOR

From an interview with Arch O. Mason, Research Engineer, Fisher Body-Ternstedt Division, Detroit

IN THE ordinary development of manufacturing industry, change comes gradually both in method and product. Change is geared usually to various expendiencies of production, cost, materials and numerous other requirements and factors. An event of transcendant impact, such as a war, may bring about almost overnight more changes than have occurred in the previous decade.

For example, the Fisher Body-Ternstedt Division plant in Detroit was, before the war, devoted entirely to production of more than 50,000 items of automotive body hardware. Then came Pearl Harbor. Overnight they started to make things no one had ever seen or heard about before. Forty years' experience in making auto hardware stood them in good stead, so far as making accurate and practical tools was concerned. They had equipped their plants with modern machine tools. To fill expanded war orders they required additional machine tools. These they could not get promptly. Hence, circumstances encouraged them to apply fast new methods successfully used outside their organization. As a result, increased production was obtained not by adding new machine tools but by faster removal of metal, longer runs between tool changes, and better finishes, which eliminated subsequent operations.

Production per machine tool per hour was increased so substantially that additional equipment and additional factory space was not needed.

Preparing for New Tools

Up-to-date tools mean new methods and new concepts about each job. *They spell new work habits.* We all know nothing is much harder to change than old established habits. Modernization of shop methods therefore requires the full support of top management. It can only be established successfully if it is supported by a carefully planned educational campaign.

The educational procedure established during the war, in this G. M. division, deserves the careful consideration of anyone contemplating similar revitalizing of their plant, a step so necessary with today's high cost labor.

The Ternstedt system had only one objective: to promote the most up-to-date tooling and up-to-date manufacturing; the kind that is often overlooked by the manufacturing establishment until years after it has proved its value elsewhere. New methods must be developed beyond the experimental stage before they can properly be applied.

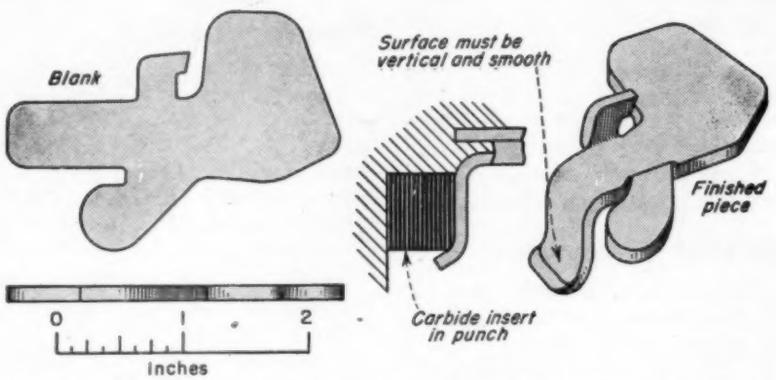


Fig. 1—Quality of the auto-body seat adjuster lock bar was improved by using a carbide insert in the punch, and the down time on the operation was reduced to one-tenth of that when a steel punch was used

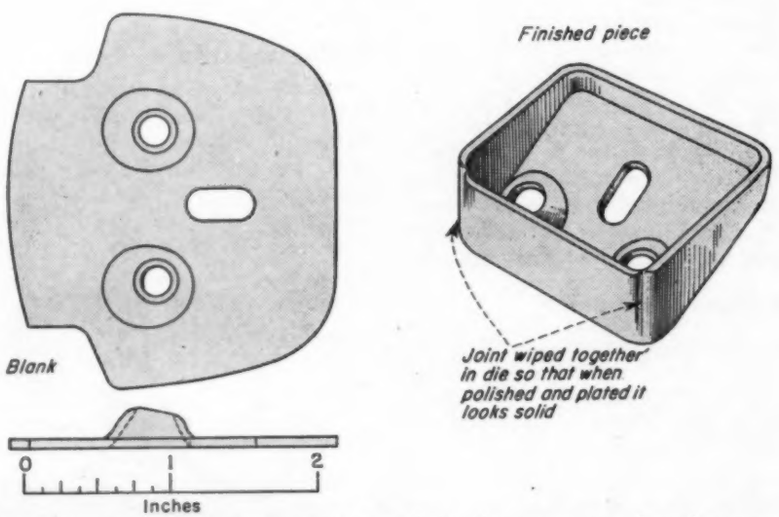


Fig. 2—Improved tool design and a carbide die wipes together the corner joints of the body-lock striker plate, made from a flat blank in one stroke

Tool Conservation Committee

To introduce such up-to-date methods in a plant where they have not been previously used requires a procedure that covers every factor that affects their utilization. To handle such problems Ternstedt formed what they called a "Tool Conservation Committee." This comprised representative members from each department. This group was charged with the specific responsibility of keeping manufacturing methods and tools up-to-date. Over a period of years the group has been successful in smoothly introducing many up-to-date methods at Ternstedt.

Members of the Tool Conservation Committee are:

1. Plant master mechanic.
2. Heads of toolrooms.
3. Tool Design Department head.
4. Research metallurgist.
5. Specialist on coolants and lubricants.
6. Methods Department representative.
7. Production Engineering Department representative.
8. Production Department representative.
9. Stock Department representative.
10. Purchasing Department representative.
11. Members of Technical staff from time to time as required.

This is an extraordinary committee for it can consider new production methods that improve quality or reduce product cost, make recom-

Typical Meeting Report of Tool Conservation Committee

Subject: Meeting 155 of the Committee for the Conservation of Tools and Tool Steel.

From: Process Engineering and Laboratories —A. O. Mason (109 copies are distributed to supervisory staff).

Present: Chief Tool Repair, Chief Tool Design, Chief Tool Application, Chief Methods Department, Technical Engineer.

Brazing Solders

Due to the increasing use of carbide-die inserts it was considered proper to call attention to the recommendation by manufacturers of silver solder of a special modification of the well-known grades of silver solder for the particular purpose of brazing carbide to steel. In order to avoid confusion in the purchasing and stocking of the different grades of silver solder, the problem of properly specifying these materials will be taken up at the next meeting. This is also important as there will probably be a considerable volume of brazing of production parts as new manufacturing programs are developed.

Production Engineering Manual

Mr. Blank reports that some new pages on Tool Engineering Standards have gone to the printers. Printed sheets will probably be available at the next meeting. This section of the manual deals with die construction, die materials and heat-treatment of die materials.

Tool Steel Specifications

New sheets showing most of the trade names and suppliers of the Ternstedt General Purpose Tool Steels, and including the die casting die cavity steel, were distributed to members of the Committee.

Nitrided Die Inserts

Mr. Blank reported excellent results from draw dies made from G.M.-M2 high speed steel and nitrided by the double nitriding method. Nitrided high-speed steel, cut-off punches are responsible for large increases in the number of pieces produced per setup on a number of other dies.

Carbide Program

Mr. Blank reports that carbide cut-off punch is being used on the C. V. Division Channel. The toolmaker who maintains this die was interviewed and reports that production per setup of this die is at least ten times as great as it was before carbide was used.

Mr. Charley, foreman of the Plant 14 Tool Room, reports that a carbide forming punch used on the Lock Bar of the Seat Adjuster, Fig. 1, increased the production of this die per setup more than 10 to 1.

Mr. Sugar reports that a carbide insert used on parts H-75124 and 5 and parts H-75126-7-8 and 9 has increased the period of operation of the dies from three or four days to three or four weeks. These parts are side-window reveal moldings for the B body.

Mr. Easy reports that he is using carbide inserts on the end treatment of eighteen parts. These parts are crease moldings and the carbide inserts perform the draw operation on the ends. Production per setup averages at least ten times previous performance and the quality of the work is much better than with the tool-steel inserts. Polishing costs on the parts are also reduced.

All of these applications have reduced down time, reduced setup costs, reduced tool repair costs, increased production and improved the quality of production. The importance to the company of the work which these men have done is hard to estimate. Recognition of its value should lead to a rapidly expanding use of carbides for the types of applications where they have already proved their value in our plants.

Table I—General-Purpose Tool Steels

Code Number and Type		Color Code
G.M.-38-M	Water Hardening	Dark Green (Dupont Enamel 410-35)
G.M.-46-M	Oil Hardening	Hi-Bis. Yellow (DuPont 410-41)
G.M.-48-M	Air Hardening	Machine White (DuPont 412-1)
G.M.-66-M	Chisel Steel	Precaution Blue (DuPont 410-43)
G.M.-M.-2	High Speed	Fire Protection Red (DuPont 410-42)

Table II—Special-Purpose Steels and Cold-Rolled Steel

Code Number and Type		Color Code
G.M.-140-M	Die Casting Die Cavity Steel (For hardened, long-run dies)	Bronze (DuPont SM 1530AA)
G.M.-6145	Chrome Vanadium Steel (For hardened-machine parts)	Aluminum (DuPont 246-4202)
G.M.-7135	Nitriding Steel (For ejector pins and dowels)	Dark Orange (DuPont 253-52357)
G.M.-1045	Carburized and Hardened (For rolling-mill rolls)	Black (Dupont 253-2122)
G.M.-1020	Cold-Rolled and Machine Steel (Not hardenable)	No Color Code

mendations, and then see they are given proper trials. An over-all committee like this is very important, for unless proper arrangements are made, trials cannot be properly made and effectively evaluated. Preparing the ground work for the actual application of any new method is perhaps the most important function of the group.

Committee Functions

Some of the functions and procedures followed by this Tool Conservation Committee are:

(*a*) Assistance in the specification of the design, material, heat-treatment, surface preparation of tools.

(*b*) Arrangements for purchase, stocking, handling and maintenance of tools.

(*c*) Arrangements covering the setup of jobs, including special fixtures.

(*d*) Assistance for supervision during the tryouts of the new tools in production.

(*e*) Assistance for supervision when new time studies are made.

(*f*) Periodic follow-up of the new method after it has been adopted for regular production.

(*g*) The recording, through the minutes of weekly meetings, of the progress of new methods and, in a general way, of the approximate benefits to the company from the points of *cost, volume and quality.*

(*h*) Checking of all tool failures. Causes are carefully determined where possible and corrections in plant procedures arranged with proper authorities when needed.

Example of Committee Operation

The urgency and importance of production problems determine the order in which each one is studied. A typical machining problem might be evaluated according to the following factors:

1. Tool design.
2. Feeds and speeds.
3. Coolants.
4. Tool grinding (superfinish).
5. Surface treatment (nitriding, chrome plating).
6. Special fixtures (flywheel attachments).
7. Condition of machine tool.
8. Suitability of machine tool.
9. Suitability of tool material (carbide, HSS, cast alloy).
10. Suitability of method (milling, planing, broaching, grinding).

This method of analysis and functioning of the committee is very flexible. It was applied with marked success to a program for simplification and standardization of tool steels used by Ternstedt.

This committee successfully converted a series of machining operations from high speed steel tooling to carbide. The conversion included the education of the toolrooms in the proper repair, grinding and inspection of the carbide cutting tools. "Without this educational work the conversion program would probably have failed," according to A. O. Mason.

Elimination of Brands

For many years tool steels for each purpose have been specified by brand name. This worked fairly well so long as both the heat-treating department and toolmaker did not get their signals crossed. Confusion sometimes resulted from the use of brand-name steels, and this was likely to be costly. For example there were two "Black Label" tool steels—one *water* hardening, the other *air* hardening. A requisition for Black Label tool steel from the toolroom could cause confusion in the purchasing department, the stock rooms, the toolrooms, or the heat-treating department. The result would be inferior tools or ruined tools and the loss of many manhours of skilled die-makers' time. These conditions needed early correction to avoid further expense.

The Tool Conservation Committee corrected this condition by classifying available steels. They boiled down 150 brands into six classes and applied the General Motors number to each. At one step, they eliminated mistakes made by the toolmaker in specifying what he wanted; by the purchasing department when a substitute had to be obtained to satisfy delivery requirements and by the heat-treating department as a result of improper information. These six general-purpose tool steels are tabulated by brand under each of the six GM numbers. Every interested department has this tabulation posted for ready reference.

Color Code for Steels

There are ten GM numbered steels in general use at Ternstedt. These are painted so no one can mistake them. The supplier is required to paint the full length bars before delivery. Steel unpainted is not acceptable (on emergency rush jobs a Ternstedt crew will paint a small lot). Color-code posters are exhibited in every department where steel is selected, received or heat-treated, and also in engineering and toolrooms where materials are specified. There are two color code posters; one for "General-Purpose Tool Steels," the other "Special-Purpose and Cold-Rolled Steels" (Tables I and II).

Reduced scrap both in tools and product is obtained by using the right material. More pieces per die setup or more pieces between tool grinds reduce costs. Reduction in shutdowns is very important. Some tools now stand up for as many weeks as they used to stand up for days.

Typical Savings

Proper choice of material was exemplified by a pair of right and left dies for a die-casting machine. Unhardened dies cost $7,000 each or a total of $14,000 for a certain job. About five sets of these unhardened dies at a cost of $70,000 would be required to equal the output of one set of properly hardened dies that cost originally about $16,000. The hardened dies made from properly selected steel cost $2,000 more to make and will not only run longer but reduce down time and delays in getting replacement dies. The actual indicated saving, if the right material and heat-treatment had been chosen at first, was $54,000, not including attendant expenses due to delays and shutdowns.

In machining, the departments have been educated in proper sharpening of high-speed steel tools. After grinding to correct shape, the cutting edges are honed to increase their life and improve the finish of the surfaces. Much experience has been obtained in using nitrided and chrome-plated tools. On aluminum parts nitrided tools increased output as much as ten times. On steel parts output was often tripled.

Carbide draw dies are being introduced at Ternstedt. Carbides are successfully used for cut-off punches and for forming punches. They stand up longer and give a smoother finish. Two examples are shown in Figs. 1 and 2.

In Fig. 1 a tongue of the piece has to be bent at right angles and the tip slightly curled. The punch goes down over the face of the tongue and practically coins the tip. The vertical face of the tongue has to be absolutely smooth. Steel dies had to be changed frequently as they would gall after a certain length of run and begin to scratch the faces of the tongues. Carbide now used stands up for five to ten times as many pieces as were previously obtained, and does not scratch or gall the parts seriously at any time.

Another carbide die job is shown in Fig. 2, where a flat piece is punched into a carbide female forming die. This closes two corners so tight and smooth without galling that the piece is practically ready to buff and plate when it leaves the die. This was impossible when done in a steel die.

Forming intricate steel pieces in carbide dies is now possible without zinc plating the material, as was required when steel dies were used.

The work of the Tool Conservation Committee is not limited to solving current troubles. An educational program is kept up to give all committee members and departmental staffs information on the latest developments and report on the progress of various projects.

Tool Engineering Standards are brought together and published under the direction of the member of the committee who represents the Tool Design Department. He is as-

Typical Tool Engineering Standard Sheet

GM-48-M High-Carbon High-Chromium Air-Hardening Steel

Chemical Composition	Percent	Chemical Composition	Percent
Carbon	1.40—1.50	Molybdenum	0.70—0.90
Manganese	0.20—0.50	Vanadium	Optional
Phosph. & Sulphur	0.20 Max.	Cobalt	2.00 Max.
Silicon	0.20—0.50	Nickel	Optional
Chromium	11.00—13.00	Brinell Hardness	255 Max.

Heat Treatment

Forging	Annealing	Hardening	Quench	Atmosphere
1850-1900F.	1600-1650F.	1800-1850F.	Salt or air	Reducing or neutral salt

Tempering Schedule

Recommended tempering temperatures 400-600 F.

Temp., F.	Hardness Rockwell C	Temp., F.	Hardness Rockwell C
400	61-62	800	57-59
450	58-61	850	57-59
500	57-60	900	57-60
550	57-59	950	58-62
600	56-58	1000	58-61
650	55-57	1050	54-58
700	56-58	1100	50-55
750	55-57	1200	45-50

Description

Warpage and cracking in heat-treating are held to a minimum. Tolerances as close as 0.001 per in. can be held in heat-treating. Has high wear resistance and high red hardness.

Uses

Long run blanking dies — Draw dies
Forming rolls — Hot swaging dies

Alternate steels for greater toughness—66-M; for wear resistance—carbide.

Fig. 3—A Tool Engineering Standards Manual includes specification and application sheets for each of the ten general-purpose and special-purpose tool and die steels. All persons responsible for tool design, specification, purchase, heat-treatment and toolmaking utilize these data to insure correct application and orderly development of knowledge regarding tooling

Standards Sheet for Die Construction

Die Sets

Use General Motors die shoes, punch-holders, guide pins, guide bushings, die springs only.

Punches

Use standard punches and retainers, see page—
On special punch retainers use standard method of retaining punch, see page—
For method of retaining square, oblong, d-punches, etc., see page—
For special punch holders, see page —
Use group punch retainers wherever possible. Where single punch retainers are used, locate in pocket.

Airlines

Avoid installation of flimsy air blowout lines. Use standard construction where possible.

Blank Dies

Grind shear in blank dies according to diemaking practice.
Blank dies must not hold more than 4 blanks.
Make blank dies sectional where practical.
Use gibs instead of stripper bolts for spring strippers and pressure pads.

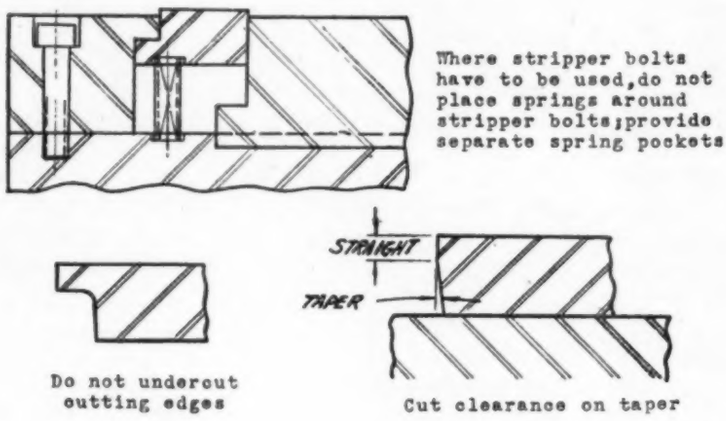

Where stripper bolts have to be used, do not place springs around stripper bolts; provide separate spring pockets
STRAIGHT
TAPER
Do not undercut cutting edges
Cut clearance on taper

Fig. 4—Die-construction details are covered in the Tool Engineering Manual. Information of this kind makes new men effective at an earlier date, avoids unnecessary deviations from proved practices

sisted in this work by the head of the toolrooms, the metallurgist, the master mechanic and others.

These standards cover both materials and the best-known shop practice in die and tool design. For example, Fig. 3 gives data referring to GM-48-M high-carbon, high-chromium air-hardening steel. It gives the chemical composition, some basic heat-treating information, including a tempering schedule, describes the possible warping and cracking characteristics, the tolerances obtainable and wear resistance. Finally, uses of the steel are given and alternate steels or materials indicated. Imagine how helpful this has been to men who, though experienced and expert in toolroom work and on dies, have always considered tool steels, heat-treatments, trade names as something of a mystery.

Die construction in this organization is very important. Hence it gets extensive attention in the "Tool Engineering Standards" manual. A sample page from this section is shown in Fig. 4. It is self-explanatory. Cross references are given to make it still more valuable. It assures that new men coming into the organization can at once follow standard practice, make fewer mistakes and gain confidence, and increase their worth to the organization because satisfactory performance is obtained from the tools they design.

Regular Committee Meetings

Weekly committee meetings are held to initiate new developments, report progress on matters already started by the committee and reports of increased outputs from tool equipment already in production.

A typical report (with names and dates deleted) is given. The most important part of the report is the listing of the men who have successfully carried out the projects assigned to them. When a man falls down he is given help immediately and no public criticism is meted out to him in the printed report, but when he makes good full credit is given him. This may seem a small thing, but *it has helped immensely in getting interdepartmental cooperation on new projects.* At the present time, 109 reports are sent out for each meeting.

Nothing Experimental

The most important thing about this whole program is that it is so simple. Its whole purpose is to bring the attention of the production staff the most up-to-date *proved methods* and show how they can be applied to current problems. Nothing experimental is contained in this program. Better production practices that have been in use for years in other General Motor divisions or other manufacturing plants but not used at Ternstedt are introduced by meetings, shop trials and when in satisfactory operation are published first in the minutes of the Committee meetings and subsequently in Process Specifications, or Standards depending on the nature of the method. Reports of meetings act to stimulate constant improvement and keep the whole staff acquainted with the latest and best production methods.

Meetings of the Committee were held biweekly for most of 1946 and later at one-month intervals, but the biweekly schedule will probably again become standard in 1947.

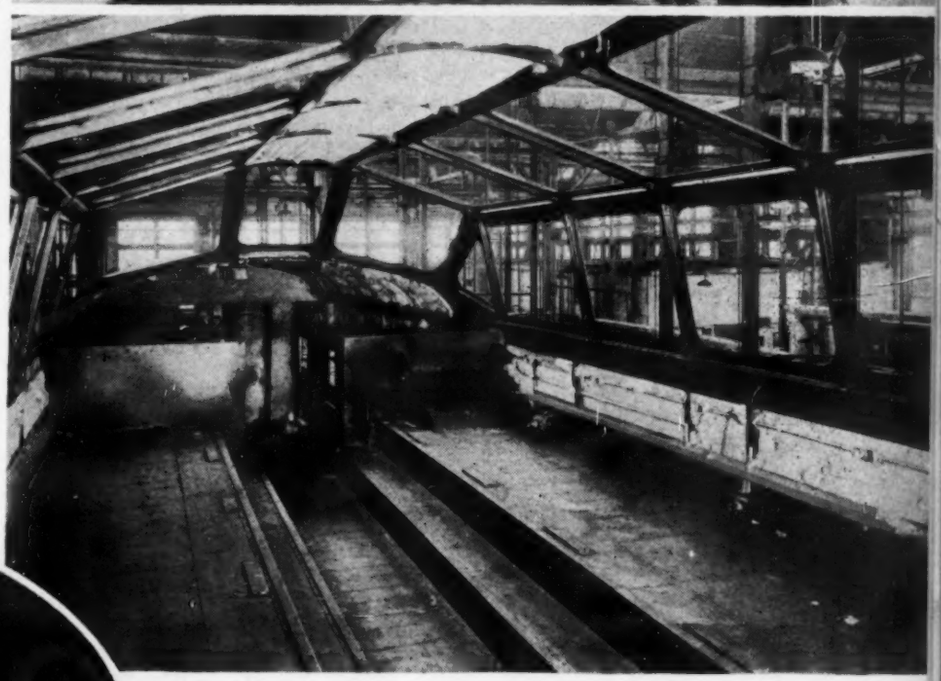
MAKING THE TRAIN OF TOMORROW

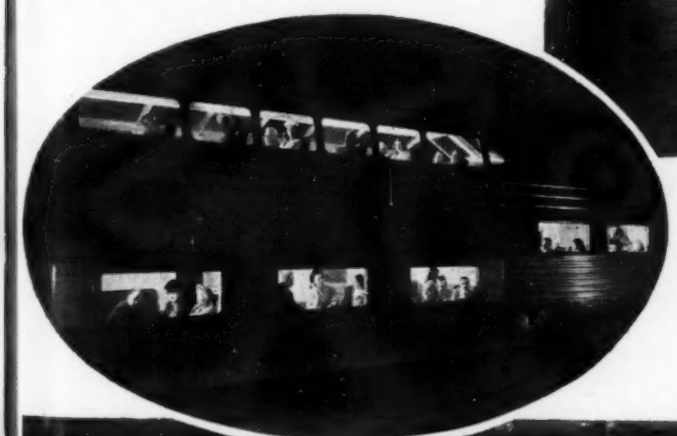
PROGRESSIVE design ideas in the four cars of the new General Motors Train of Tomorrow created special fabrication problems for Pullman-Standard, the builder. These exclusive progress photographs show some of the solutions in "Dream Cloud," which sleeps 20 with 50% more clear floor area.

Key innovation in the 85-ft. cars is the 10x30-ft., 24-seat, "Astra Dome" of high-strength steel and heat-, glare- and impact-resisting safety glass. For efficient space utilization, cars are double-decked at the center (upper right). There are actually four levels, the normal one at the ends, a ramped passage at side center, and the dome.

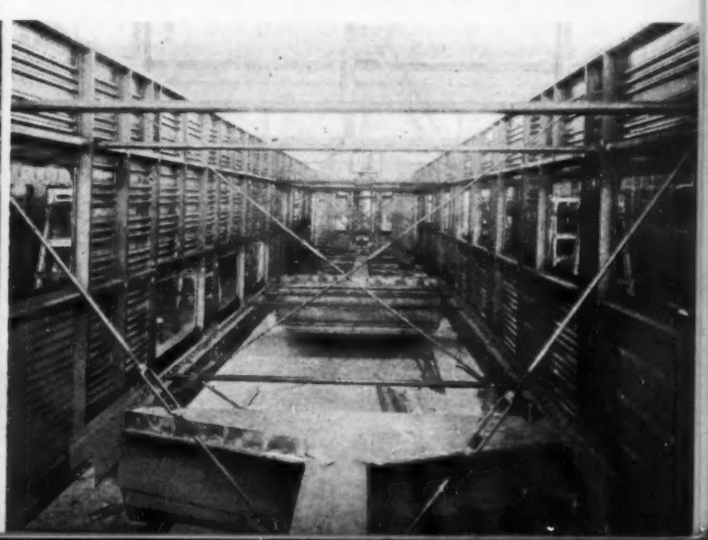
The Astra Dome itself has seats two steps above the center aisle for visibility (right). Center clearance is over 6 ft., even though air-conditioning delivery and return ducts are along the ceiling there. Thermopane windows in the dome are set in live rubber to allow for differential expansion. They and heavy insulation in walls reduce air-conditioning load.

Tight-lock couplers are spring-loaded to avoid jerking, spring hangers are outside trucks to reduce sidesway three quarters, and special rubber snubbers cut lateral axle movement.





Clearance for the Astra Dome (left) is provided by lowering floor level at the car center. Opposed wishbones of welded-steel plate with side trusses provide an underframe (below, left, in assembly fixture) with a well, yet as strong as the usual center sill. Car sides are stiffened with corrugations (below, right), and center-sill sections at car ends provide under-car compartments for diesel-generator sets and air-conditioning compressers and condensers



Continuous Furnace Brazing... I

DESIGN AND HANDLING

Metal products may be turned out at lower processing cost by using two or more parts in assembly by continuous brazing

BY C. L. WEST, VICE-PRESIDENT
THE ELECTRIC FURNACE COMPANY

METAL PARTS assembly by brazing has been developed to the point at which design engineers are able to effect substantial economies by designing many products in two or more parts instead of one. Optimum strength can be obtained in multiple junction points which, combined with modern continuous furnace-brazing technique, puts high-strength brazing on a production basis. In one rather extreme case of materials-saving, a furnace-brazed assembly of steel plate stampings replaced a heavy forging and saved 30 lb. of steel.

Parts assemblies, in general, are heated in a furnace in a reducing atmosphere with the brazing medium adjacent to the junction point of each connecting part in the assembly. After the heat application, the assembly is cooled within the reducing atmosphere in a cooling hood attached to and forming an integral part of the furnace equipment. Cooling temperature is closely controlled to avoid oxidation of joints.

When the brazing medium melts and is drawn through each joint by capillary action, it alloys with the parent metal of the parts being joined and an excess of the brazing medium usually forms a fillet which adds to the strength of the joint and increases resistance to vibration and impact loads.

High-Temperature Service

Furnace-brazed joints for high-temperature service are usually produced with copper (melting at 1980 F) and the alloy formed in a joint when uniting steel assemblies has a melting point higher than that of pure copper. Such assemblies can be carburized, hardened and drawn with no deterioration of joint. Brazing of properly designed assemblies in a reducing atmosphere minimizes and obviates residual local stresses ordinarily set up by localized heating of the parts to be joined.

Furnace design can be arranged to meet hourly production requirements, involving different sizes, shapes and weights of assemblies in a unit cycle. When assemblies, employing proper brazing media and furnace heats are delivered from the furnace atmosphere, they are free of oxide and may be routed directly to processes such as plating or painting.

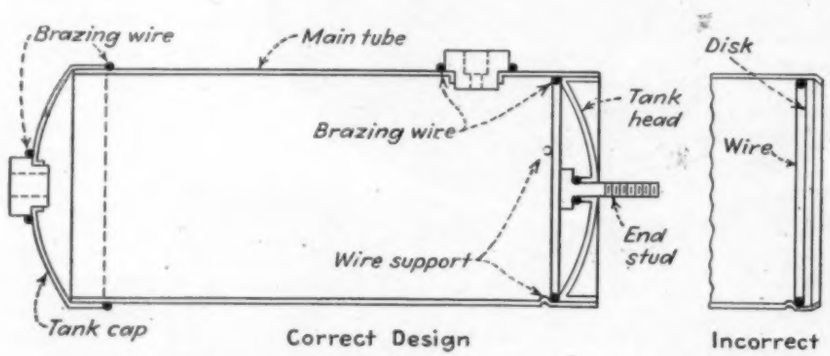
The ideal condition is to design assemblies of parts in such a manner that they will be self-sustaining during their travel through the heating and cooling chambers of the furnace without special clamping fixtures. However, with assemblies such as float balls, light gage sheet metal fixtures prevent them from rolling around on the furnace conveyor. These fixtures need not be maintained with any particular degree of accuracy if properly designed.

Fixtures of a type designed to clamp or hold parts of assemblies together in a furnace should be avoided if possible because repeated heating and cooling of fixtures causes them to distort and increase maintenance cost.

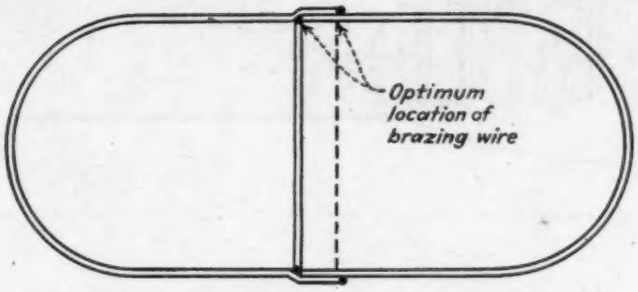
Vacuum methods of clamping assemblies such as evaporators, shells and liners for refrigerating equipment have been found useful. Sheet material, brazed by a thin foil and having openings which can be plugged at one end, are suitable for applying a partial vacuum as a means of drawing the sheets together for joining. Vacuum nozzles are applied to the assembly as it passes through the furnace heating chamber.

Other Methods

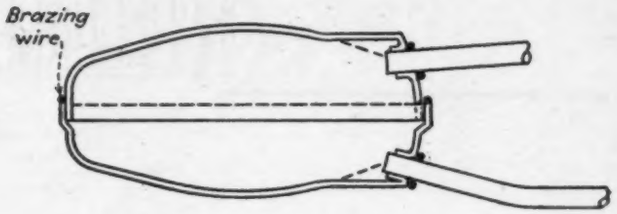
Several other methods of holding parts of an assembly in proper registration include tack-welding, staking, crimping and pinning, depending on the component and joint shape of the assembly. Weights have sometimes been used for holding parts together during brazing but should generally be avoided because they retard heating of the object to be brazed, add to the tare weight to be heated and require larger equipment.



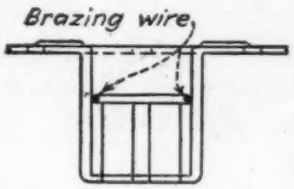
LOW EXPANSION DIFFERENTIAL—Correct design, as in the application of a dished head to this receiver-tank assembly, prevents undue stress and distortion. The end stud is pressed into the head, pushing the brazing ring ahead of it to contact the flanged opening. The dished head is then pressed into the main tube to form a tube of identical wall section within the main tube. Three or four shallow indentations hold the brazing ring tightly against the joint. The sheet-metal cap is pressed over the main tube at the other end with the brazing ring ahead of it



TELESCOPIC JOINTS—Float balls are assembled with a nesting or telescopic joint at the center line, a hand-push fit leaving a 0.002-in. clearance. Holes for tube insertion are extruded inward for a short tube effect and added strength. Tubes are pressed into the ball with the brazing ring contacting the ball section and another ring surrounding the ball and resting on the shoulder of the female half. The long tubes hold the balls in position on the furnace conveyor and eliminate fixtures

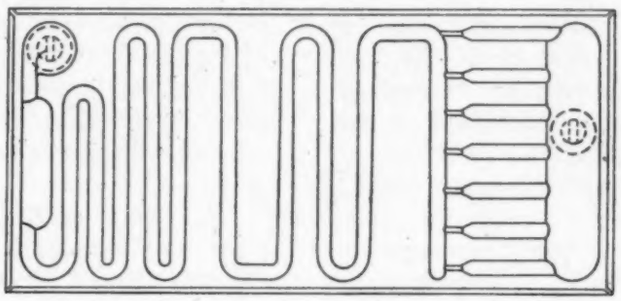


LONG TANK BRAZING—Horizontal telescopic joints are frequently used in production of either long or large-diameter tanks of various shapes, which are conveyed through the furnace in a horizontal position. Assembly is a light press fit and a light sheet-metal fixture prevents the tanks from rolling on the conveyor and disturbing brazing metal flow. Sometimes it is necessary to lightly tack-weld the two halves at the telesocpic joint to avoid any separation before joining takes place

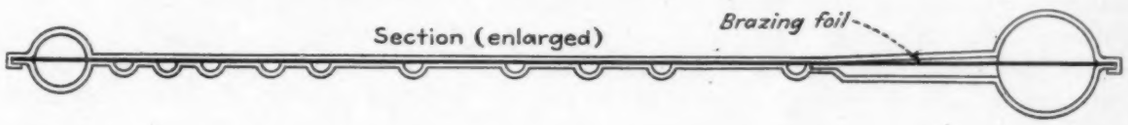


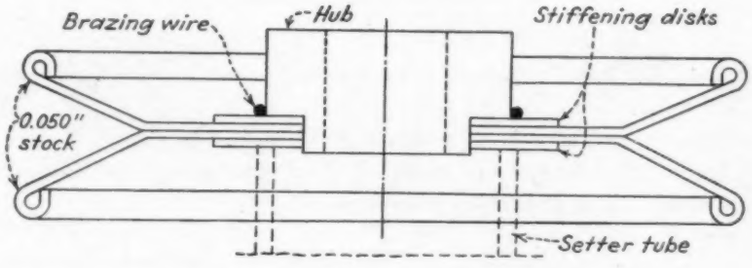
HUB FABRICATION—Flanged hubs, equivalent to parts machined from forgings or from the solid, may be brazed in assembly. A flanged shell is drawn from the plate gage required for the flange and a rolled ring of plate steel material is pressed into the shell and copper-brazed in place. No fixtures are required for maintaining these parts in position on the furnace conveyor

VACUUM CLAMPING—In evaporator assembly, comprising a male shell and a formed female shell, vacuum may supplant mechanical devices. A thin foil of copper is placed within the female half covering all the contacting area and the male half placed over the foil (section, below). The upward (90° to horizontal) protecting edges of the female half are bent in and down over the male half to form a typical lap seam all around the outer edges. A plug is inserted in one of the two holes provided in the evaporator boilers and the assembly is ready for brazing. A vacuum nozzle is placed into the second boiler hole and a partial vacuum pulls the two shells together while the foil melts in the intermittently-operating roller-hearth furnace



WATCH TIGHT JOINTS—When parts are to be assembled by brazing there is a possibility of a bell-mouth condition being caused by abnormally tight joints. The condition shown here is exaggerated and the actual opening may be anywhere from 0.005 to 0.015 in. This is enough to affect the capillary action at the joint, disturb the even flow of the brazing medium and give an incomplete braze and a rejected product





PULLEY ASSEMBLY—V-belt pulleys of one type consist of two main flanges forming the V-groove and web, one or more stiffening disks and a hub. The disks and two web members may be spot-welded, or the hub may be crimped or staked or the assembly may be placed upon a short length of tube for supporting the assembly and contact maintained by weight of the parts. If the parts are in intimate contact a ring of wire around the hub will melt and wet all surfaces in flow. A smaller hub flange saves material

ROUND TABLE

Vacation—A Loaf or A Leave?

"What seems to be ailing Thompson, Al? He's as touchy as a bear these days. Thought when he came back from his vacation that he would be pretty well normalized."

"I haven't said anything to you about it, Ed, but the truth is that Thompson didn't take a vacation."

"Are you kiddin'? He wasn't in town for two weeks—and I know he wasn't around here because I put Miller on his machine while he was gone."

"No, Ed, I'm not kidding. He let slip a word or two accidentally that made me curious. Thompson—who left here almost exhausted, according to his own words—was busily occupied up in Detroit at the Speedemup Tool Company."

"Well, after all, Al, that's his affair, isn't it?"

"That's what I thought for awhile, Ed. The more I thought about it the more I wondered if he did the right thing. While I'm not much on integrity and ethics, I do know the difference between right and wrong."

"Al, you should have been a preacher. What's wrong with a man making a little extra jack now and then? Surely a man can do with a little of that these days when the dollar refuses to stretch."

"Plenty, I have finally decided. It seems to me that a man owes it to himself, his family, and his employer, to spend a few weeks, at least once in a year, in rebuilding his physical being. It's good for the nerves to get away from it all and have a complete change."

"Look, all the doctors and college professors say that a vacation should be a change—and going to Detroit is certainly a change! Besides, he got a chance to see how they do things in an outside shop. That's good for him and good for us—and he makes extra while he does it."

"But, Ed, working in a shop is no change, after all. He didn't get the complete change we said vacations would give us. I'm afraid that if news of such a trick gets to the main office that it will undo all we have fought for in the past several years."

"Well, Al, after all that's Thompson's funeral. If he wants to make a nervous wreck out of himself, why should we kick? He's the loser. And why should the front office get into it—it's his business."

"Don't agree with you again, Old Man. One irritable man in the shop can upset the apple cart; besides, I've come to the conclusion that it's strictly dishonest for a man to leave on a paid vacation, then deliberately hire out to someone else—actually getting double pay for the time."

***DOES THE CHANGE** in environment make up for lack of change of occupation? Is a man honor-bound to "relax" for his vacation time? What are the ethics of this situation? Your opinions and experience will interest others. Discussions of earlier topics appear on later pages.*

Practical Ideas

Basic Automatic Chuck Holds Different Parts

F. HARTLEY
Pawtucket, R. I.

A casual glance at these three dissimilar parts would first indicate that three different methods of holding them would be in order. Yet by starting from an arbitrary working line in each case and working back through the spindle of a chucking machine to the hydraulically-operated unit at the outer end of the spindle, it will be shown that one general setup is sufficient to clamp all three parts simply by changing only the chucking element and three clamping fingers.

The chuck body A, is attached by means of three screws to the spindle nose B, center drawing. Moved hydraulically through the spindle of the machine is a draw-rod to the end of which a stepped sleeve D is secured in place by means of the washer and screw at E.

Consider this draw-clamping rod for a moment. It could be operated by a handwheel on a screw thread or by other than hydraulic means depending on the equipment at hand.

A three-pronged floating block E, held to sleeve D with collar F, equalizes and tightens the three clamping rods G, which slide in bushings H and J, and draw the clamps in against the work when moved to the left.

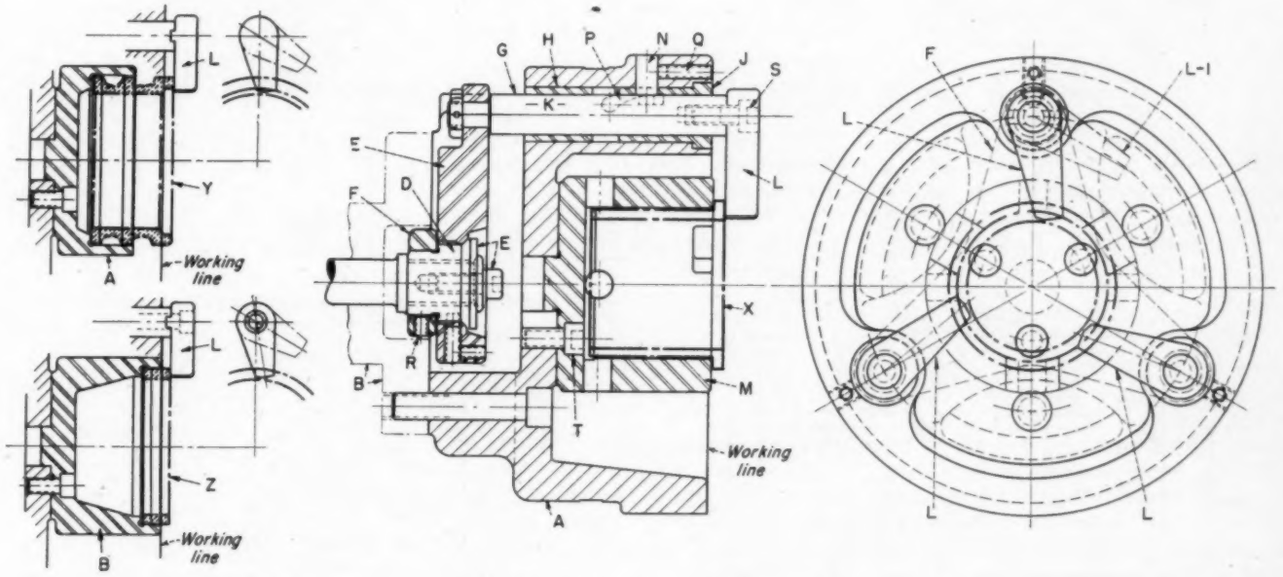
In this setup, the work X is a shouldered bushing. It is centered on its finished outside diameter in the hardened steel ring M and the operation performed consists of accurately boring the hole to size.

Clamps L are shown in the tight position with the work clamped aganist the outside shoulder from the end. As the clamps are released, they turn away from the work until they assume the position shown at L-1, permitting work removal without touching the clamps. This is accomplished with a pin on the end of screw N which enters and is in contact with a helical slot P in each rod.

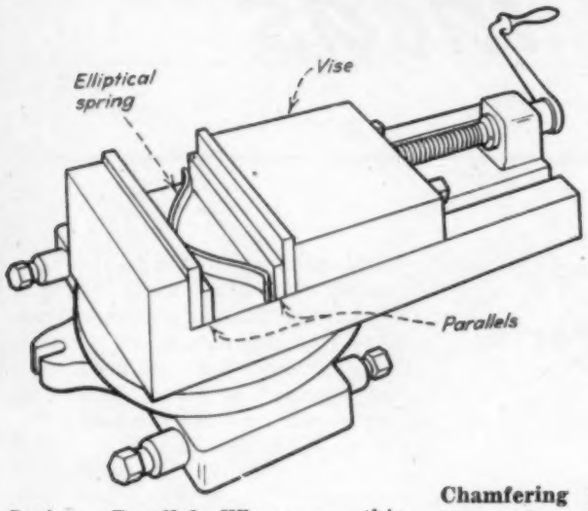
Guide screw N is locked in place by a setscrew and brass shoe at Q, while the screw R is merely used to keep block E in position when the whole fixture is removed.

After machining all the parts in a run, clamps L are removed by taking out screws S. The holding sleeve M is then removed by taking out screws T. These parts are replaced with a different sleeve A or B and three clamps to handle a part like Y, or Z, for instance.

Sleeves A and B are so designed that the work clamping point is in the same relative position as in the sleeve M resulting in a minimum of machine adjustment when setting up.

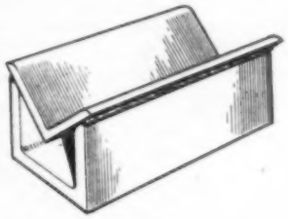


Three rods and clamp fingers seat and hold various parts longitudinally, each part in its own close-fitting chucking sleeve. At center, X represents the work, M the sleeve, A the chuck and B the spindle nose. The two views at left indicate modifications of sleeve M; sleeve A chucks part Y; sleeve B chucks part Z



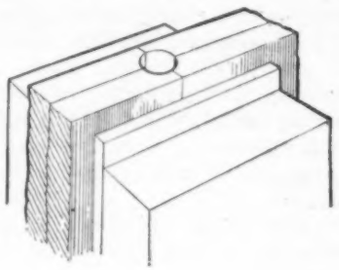
Spring Parallel—Whenever thin parallels are used in a milling vise to raise work from the bottom of the vise, two troubles are likely to be encountered. In placing and removing work, when the jaws are open, the parallels can fall over very easily, and the setup always has to be made with care. Besides this, chips and dirt can get beneath the parallels and throw them out of line.

Flat elliptical springs of suitable length can be riveted to the parallels in such a way that a pair of parallels will stay firmly against the jaws over a considerable adjustment range. *Joseph Villiger, Dixon, Illinois.*

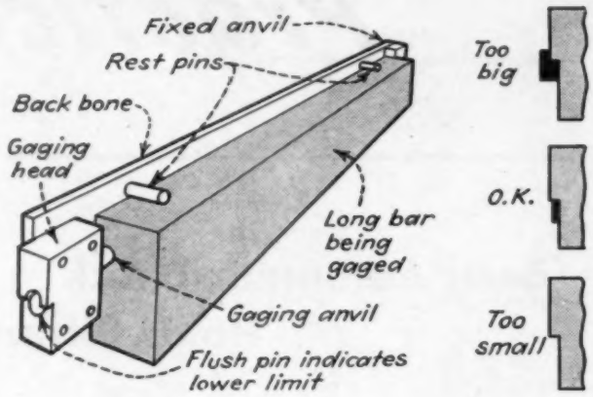


V-Block—A piece of angle and a piece of channel can be welded together into a good V-block. *F. J. Peragine, Brooklyn, New York.*

Chamfering pieces in preparation for welding can be done quickly by placing them four at a time in a vise and drilling along the central intersection. *Oscar Craft, Brazil, Indiana.*



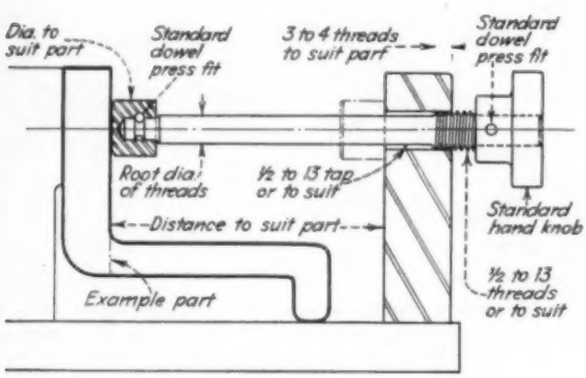
Extension Clamp—For use with production fixtures or as an all-purpose emergency clamp, the idea of a long vise screw fitted with a floating anvil at one end and a knurled wheel at the other can often be incorporated to good advantage. In addition, it is well to provide a semi-permanent vertical member which could be made from a piece of angle and bossed to give several threads so the clamp can be used as a unit or the screw used alone. *Nicholas Rosmando, Riverside, N. J.*

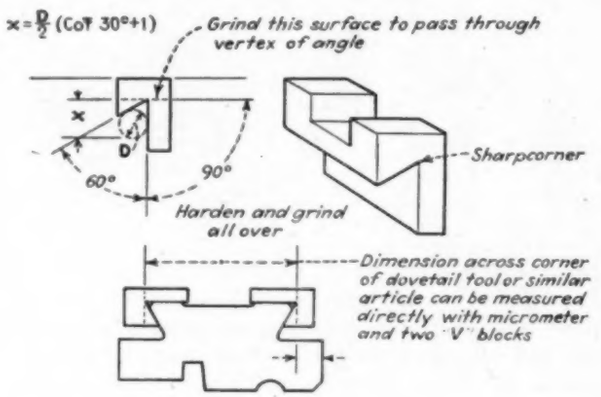


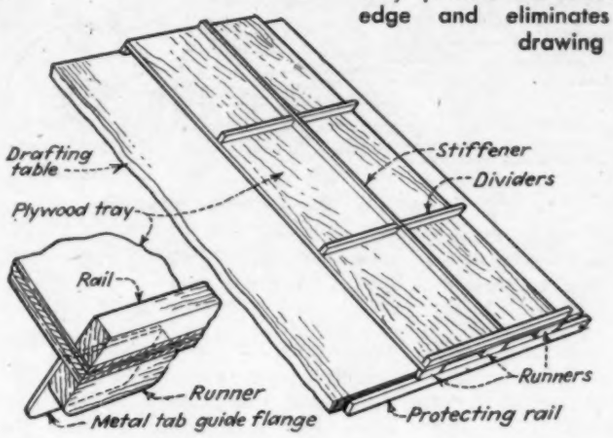
Long Limit Gage—A snap gage for a piece 46⅝ in. long requires the highest skill for reliable results. Here is a simpler idea for performing work of this kind. Pieces to be tested are laid in the frame against the fixed anvil and rest pins and the push pin is shoved against the other end of the work. A step in the gaging end of the push pin block indicates the maximum and minimum limits and makes reading easy. *M. W. Bossman, Dayton, Ohio.*

Dovetail Gaging Blocks — Sometimes it is necessary to find the distance across the corners of a dovetail where the corners have been chamfered for practical purposes. To obviate the necessity of expensive and special micrometer calipers, two small V-blocks can be made to do the job quickly, simply and very accurately. Also, these parts are rugged and will occupy very little space in a toolbox.

Most dovetail tools are made with a 60° angle, but the V-blocks can be made to suit any special angle and work equally as well. *Benedict Benith, Flushing, L. I., New York.*


Dia. to suit part
Standard dowel press fit
3 to 4 threads to suit part
Standard dowel press fit
Root dia. of threads
½ to 13 tap or to suit
Distance to suit part
Standard hand knob
½ to 13 threads or to suit
Example part


x = D/2 (Cot 30°+1)
Grind this surface to pass through vertex of angle
x
D
60°
90°
Harden and grind all over
Sharp corner
Dimension across corner of dovetail tool or similar article can be measured directly with micrometer and two "V" blocks



Tray permits full travel of straightedge and eliminates soiling the drawing

Sliding Tray Holds Drawing Instruments

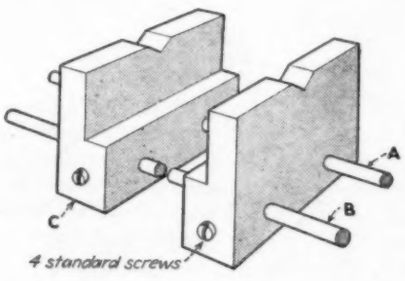
W. D. CHIVERTON
Grand Rapids, Mich.

I was considerably annoyed by having to move my triangles, curves, and drafting instruments from place to place on my drafting table each time I wanted to move the sliding straightedge on the board so I had the pattern shop make a tray to hold the instruments above the straightedge.

The tray can be slid along the runners to any place on the board convenient to reach and because the tools never touch the paper, it doesn't get soiled. The runners were made high enough to allow about ¼ in. clearance between the sliding parallel straightedge and the underside of the tray.

The tray is large enough to hold all the frequently used instruments and still allows room for sketches, small parts prints, ash tray, and small models.

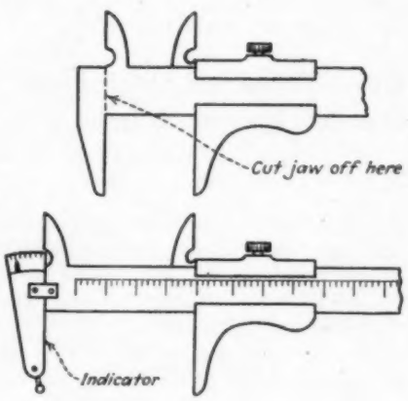
To this basic idea many improvements and accessories can be added to fit the individual's taste or the needs of a particular designing or drafting job.

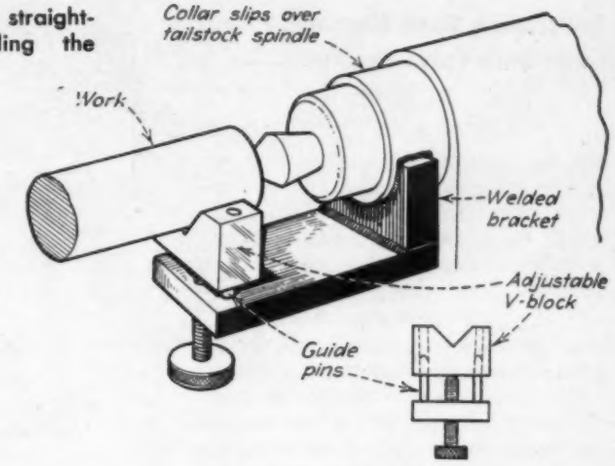


Adjustable V-Blocks—a pair of stepped V-blocks mounted on two parallel rods make a convenient all-purpose rig for drilling round stock or complicated pieces which have to be lined up in two directions. The fixture can be used as a vise when a C-clamp is added. *Edward J. Carey, Brooklyn, N.Y.*

Converted Caliper—The jaws on this caliper were too worn to be accurate, but by substituting an indicator for the stationary jaw, and regrinding the movable jaw, I was able to convert an otherwise useless tool into an efficient and highly reliable instrument.

The leg of the indicator can be set, so I bring the movable jaw into the zero position on the scale, and set the indicator to read five (or anything over zero) when in contact with the jaw. Bringing the indicator and movable jaw in contact with my work until the indicator reads five again indicates that the measurement on the vernier scale is correct. *Walter J. Hoeckele, Bloomfield, N.J.*





Adjustable work rest supports heavy pieces while mounting and removing from the tailstock center

Tailstock V-Block Helps Position Heavy Work

J. H. QUATKEMEYER
Norwood, Ohio

One way to reduce worker fatigue on an engine lathe is to install a work rest in the tailstock. This tool is just a piece of tubing to which has been welded an arm that extends toward the headstock. Upon this arm is mounted a small V-block which is adjustable for height above the arm. The work, which would be at the awkward weight, (not heavy enough for the crane but just heavy enough to tire the operator after any length of time), is placed in the headstock center and then allowed to rest in the V-block. The V-block is pre-positioned in such a manner that when the tailstock center is run into the work center, the piece is lifted clear of the V-block and is, therefore, able to rotate freely.

Die Sinking—Shrinkage allowance for die-cast aluminum is 0.00675 in. per inch. This would mean an increase on ¼-in. radius fillets of 0.0017 in. or require a cutter 0.50034 in. in diameter. If the cavity were machined with a standard ½-in. cutter, the casting would have a 0.248-in. radius fillet which should be close enough for anybody on a non-critical dimension like this, and thereby save the expense of a special cutter. *Cliff Bossmann, Dayton, Ohio.*

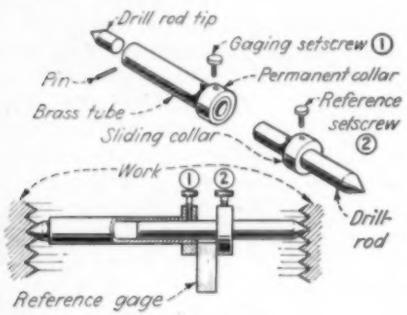
Telescoping Gage Measures Large Gate Valve Threads

JOHN PROCTOR
Pasadena, California

Reconditioning large pipe fittings requires the measurement of large internal thread diameters. This gage, made from standard tube and rod stock, can be removed from the work in a collapsed position without destroying the reading. Reassembly then permits an outside caliper to take off the dimension measured.

Setscrew No. 1 locks the gage in the work; setscrew No. 2 then clamps the loose collar any fixed distance away from the tube flange, using a convenient piece of stock as a spacer block. This distance should be large enough to allow the gage to collapse out of the depression for easy removal when setscrew No. 1 is loosened.

Care should be taken in re-expanding to replace the gaging piece in exactly the same position unless a true parallel is used.



Simple gage permits indirect measurement of internal recesses

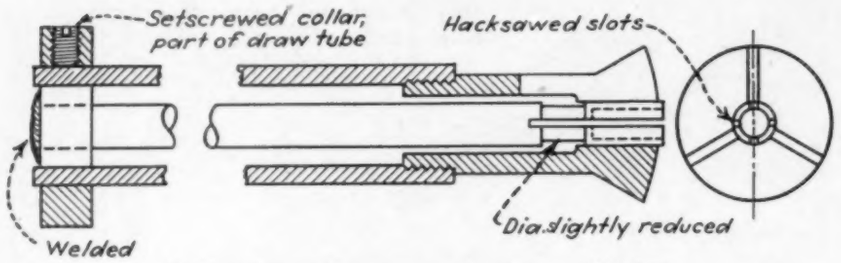
Anchored Collet Inserts

JOHN S. CURTISS
Belmont, California

Odd-sized production chucking jobs are usually done with soft liners flanged at the mouth and bored in place in a standard collet.

These have many bad habits—they lose their spring and fall out, or get squashed undersize; they shift forward when pressure is released and collect dirt behind the flange, throwing the work off if the pieces are colletted to a shoulder or to bottom; they rotate, doubling the run-out of the collet at times; and often they fall clear out of the spindle.

This liner is anchored in the drawin tube. I used the crushing effect of a setscrewed collar that is part of the mechanism, but a light drive fit would have sufficed. First, the rod used (which should be about one-eighth larger than the collet hole desired) is drilled undersize and the slots hacksawed. The head used for anchoring is then welded on, the rod, fastened in place, and the hole bored out. The slight reduction of diameter shown is optional, but it tends to increase the flexibility of the jaws; the hacksaw cuts should be three times as long as the rod diameter, for the same reason.



This collet reducer is made from solid bar stock and setscrewed tightly in the draw tube

This liner will not misbehave in any way. Its accuracy is close to perfection, regardless of the condition of the real collet used. And most of the material used is recoverable. One caution: the whole machine and collet liner must be at operating temperature if colleting is to bottom or to a shoulder, otherwise the expansion of the entire bar can throw the work off.

Blocked Work and Longitudinal Feed Cuts Keyways in Lathe

ARTHUR SILVESTER
Philadelphia, Pa.

An oil tanker's broken deck hoist axle, and no replacement on board, would have delayed the sailing for a couple of weeks had it not been for this unusual lathe setup.

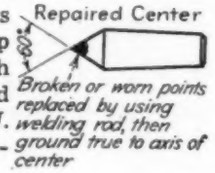
The keyway had to be ½ by 7/16 by 12 in., much too large to cut by hand, and the only machine tool available was our big lathe. The shaft itself was easy enough to turn. After this was done, we left the piece on centers but transferred the dog from the faceplate to a hardwood block bolted across the ways. In fact, the dog was wedged in place so the shaft couldn't turn in either direction.

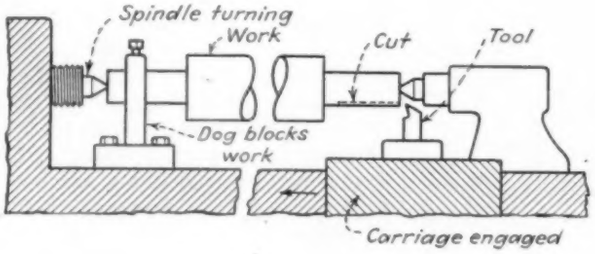
Tools of increasing widths were made, and mounted one by one, vertically on the carriage. A very low feed was used, and only about 0.010 in. was removed per cut. After a narrow slot was cut almost to full depth, the larger tools were put in until full width was obtained. Then a very low feed was used for the final finishing cut.

The headstock center was liberally oiled because of the rotation of the center against the stationary work under constant direct tool thrust, but on thinking back, it would have been better to turn the shaft end for end thus putting the thrust away from the rotating center.

The job took 6 hr., which may seem long, but it was a lot better than a long wait for a replacement shaft.

Repairing Centers — Worn centers can be built up quickly with welding rod and reground. *F. J. Peragine, Brooklyn, N. Y.*





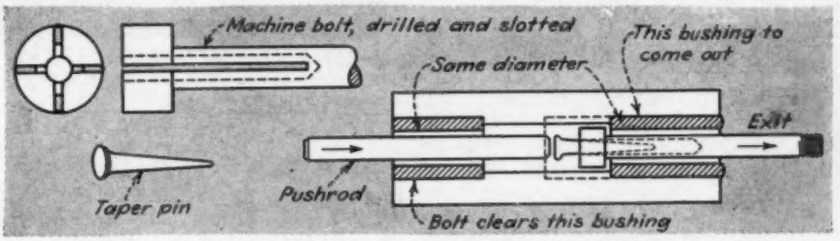
Emergency repairs can be effected by planning a keyway in a lathe when the work is blocked and longitudinal feed is engaged

Expanding Extractor Removes Blind Bushings

HARRY A. LIVINGSTON
Holyoke, Massachusetts

To remove one bushing per piece in a batch of parts containing identical bushings, one in each end, we used a slotted expanding bolt. The bolt head was first turned so it would just slip through the bushing, then drilled and slotted.

In this instance, the work was open at both ends so the bolt could be inserted from either direction, a taper pin driven into the drilled head, expanded, and the bushing pushed out in an arbor press. For blind bushings having any bottom clearance at all, though, the same procedure could be followed by first inserting the taper pin lightly, then pressing the whole assembly tighty together so the work itself would drive the pin into the slotted head, expanding it, and drawing the bolt and bushing with a stack of washers and a nut.



Bushing puller works by expanding a slotted-head bolt with a taper pin behind the bushing, then driving with a drift

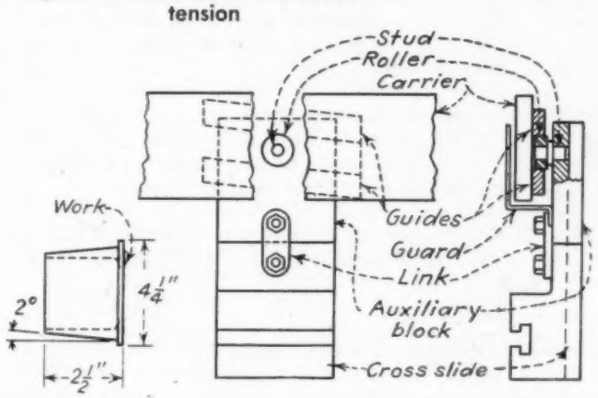
Lathe Taper Attachment

DONALD A. BAKER
Boonton, N. J.

Simple tapering and profiling are easy with this more or less conventional attachment. A carrier or guide support is bracketed over the rear lathe way high enough to pass the cross slide or cross slide extension and the taper or profile guides. Taper guides are permanently or adjustably mounted on the under side of the carrier and a follower roller is mounted on the cross slide. The complete unit is protected from chips by a sheet metal cover or guard.

The dovetail and gibbed cross-slide extension is necessary when the cross slide itself won't reach or when it is desirable not to deface the lathe with too many drilled holes. But use of the extension can have adidtional advantages. It permits an inversion of the elements, placing the guides on the extension and the follower on the rear of the lathe, which in some instances may prove much simpler in the long run.

Production taper, duplicating or profiling attachment uses a cross-slide extension



Circle and Straight Line Scriber

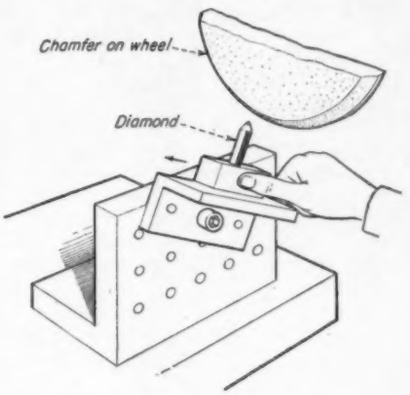
L. AVRIL
Youngstown, Ohio

Laying out bolt-circles on punch and die rings, die shoes, punch holders and numerous other jobs, can involve considerable trouble and lost time finding the proper length of wood or suitable material to place inside the ring in order to establish a center to scribe a circle with a trammel.

When using this tool no center is required in circle scribing providing the outside diameter has been machined.

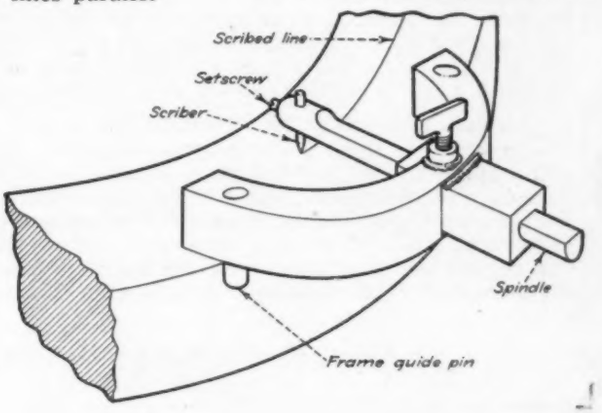
Set the frame on the ring, loosen the clamping screw and adjust the spindle to the desired circle by estimating and clamp. Scribe opposite arcs, check the size with a scale, and make the necessary spindle adjustment.

The tool will scribe lines parallel to any straight edge or at a uniform distance from any circular arc, but the edge distance will vary on irregular or transition curves. This inaccuracy can be minimized by placing the guide pins close together in relation to the radius of curvature.



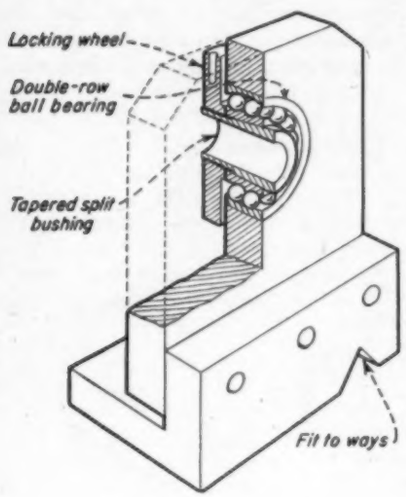
Wheel Dresser—Two angle plates adjustably bolted together provide a handy and accurate way to dress grinding wheel chamfers. Accuracy is limited only by construction of the parts, and the care taken in adjusting. *Arthur F. Hird, Lakeview, Ontario, Canada.*

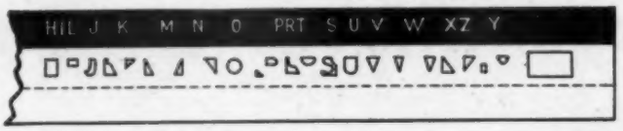
Guide pins making a positive chord keep the frame-controlled scriber arm on the arc radius at a uniform edge distance



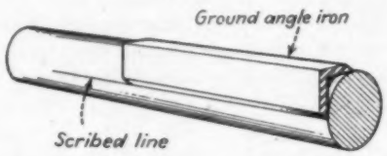
Steadyrest—A self-aligning production steadyrest can be of inestimable value in lathe operation because it assures concentricity and protects the finish of the work. The rest body itself may be of any design but it must be solidly constructed to give satisfactory performance.

The work is placed in position in the split bushing, the bushing pin is engaged and the locking wheel is tightened. The locking pin is then disengaged and the work may be machined. Remove in a like manner by loosening locking wheel. *Edmund L. Johnson, Pittsburgh, Pa.*





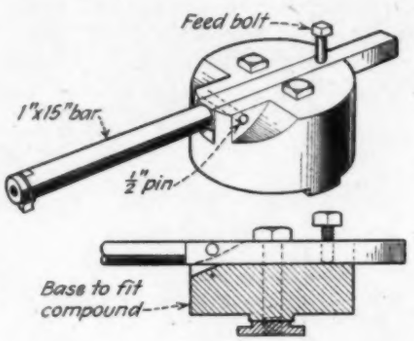
Opaque Guide—Transparent lettering guides having embossed gold lettering are often hard to read because of poor lighting and the confusion of the already completed drawing which shows through. Sometimes it is necessary to lift the guide away from the paper to read the gold lettering. Gluing a strip of dull black paper on the bottom of the guide behind the lettering blocks out the drawing and makes the gold lettering stand out prominently.



Scriber—Tool steel angle ground down to a 0.005 in. edge on each leg makes a handy tool for drawing straight lines on round barstock. The guide itself will remain straight if carefully pushed along the bar scribing lines as it moves. *George Michaud, Lynn, Mass.*

Key Seating Tool—Recently having 25 ¼ by ½-in. keyways to cut in cast iron V-sheaves, I made a device to cut the keyways utilizing my 18-in. lathe which also turned the sheaves.

Mounted as a boring bar on the lathe compound, the device operates by moving the carriage forward and backward. To feed the device, turn the feed bolt ⅛ turn on the forward movement; then loosen the bolt ¾ turn on the rearward stroke. I successfully cut the keyways in about 20 min. per sheave. *Wallace E. Ryle, Norman, Okla.*



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Thirty-first Selection—S. Framurz' Groove Radius Determination

NEWS OF METALWORKING

High Storage Cost of Surplus Items Prompts Congress to Pressure WAA

WASHINGTON—Congress will tell War Assets Administration to catalog the machine tools in some major warehouses and dispose of them with all possible speed.

Warehousing in Michigan, for example, has cost taxpayers $8,220,665 or more than $400,000 a month. Ninety percent of surplus in Warehouses No. 2 and 3 is machine tools. Total machine tool warehousing cost is $26 million a year.

The Senate Surplus Property Committee has asked Administrator Littlejohn how long it will take to: catalog the machines, meet priorities, sell to the public, meet JANMAT requirements, sell the balance for scrap, close up and stop the overflow of rent money. If the catalog scheme works, it will be applied to the whole surplus sales program.

End of Priorities Seen

There is no assurance, however, the catalog plan will work any faster than the present invoice-firming plan. Catalogs are fine for producers, but not so good for liquidators. It will take time to prepare catalogs, and before they are printed, many items listed might be out of stock.

Meanwhile WAA will push supplies to priority holders, hoping to satisfy all their demands, and ask Congress to terminate all priorities by the New Year. Extremely small veteran groups, in the surplus property business, are maintaining pressure for preferences. A vast majority of vets don't want surplus of any kind, are not interested.

Tagging Query Unanswered

The committee received no satisfactory explanation from WAA on Army-Navy tagging for reserve. JANMAT's tagged machines are for sale, like untagged tools. The committee asks: Why tag them at all? Why not let JANMAT take what's left?

JANMAT and WAA are accused of tagging tools in short supply, contrary to the Steelman letter authorizing the program, which instructed that only long-supply and single-purpose machines were to be earmarked.

WAA spokesmen for the committee admitted its liaison man for Army and Navy doesn't know one machine from another, but claim their selection teams do. They explained that some long-supply machines had been tagged and had since come into short supply.

Tags may be ignored if the machines are to be sold for domestic service. That, however, covers nearly all of them, since there is very little export. But Littlejohn is trying to push exports.

Program Moves Slowly

The JANMAT (Army-Navy machine tools) committee now says it wants 71,000 pieces. This program, like WAA disposal, is moving slowly. As of June 3, only 22,320 pieces had been tagged, and only 621 had been shipped. It is estimated that 150 people, both WAA and JANMAT, are working on the job.

The JANMAT program is uncoordinated. Teams working simultaneously in different warehouses, select more of any given type than the committee has called for. Later, their take is trimmed down to the quota. Meanwhile tagged tools are unavailable—to purchasers unaware that the tags mean nothing.

Probing for reasons why machine tools and other industrial equipment haven't moved, the surplus committee, headed by Sen. Homer Ferguson (R., Mich.), wanted to know whether the warehouse contractors, operating on cost plus fees, might be stalling disposal.

Current Inventory $544 Million

WAA's current machine tool inventory is $544 million; sales to date total $645 million, cost figures. Cash recovery is running about 40%.

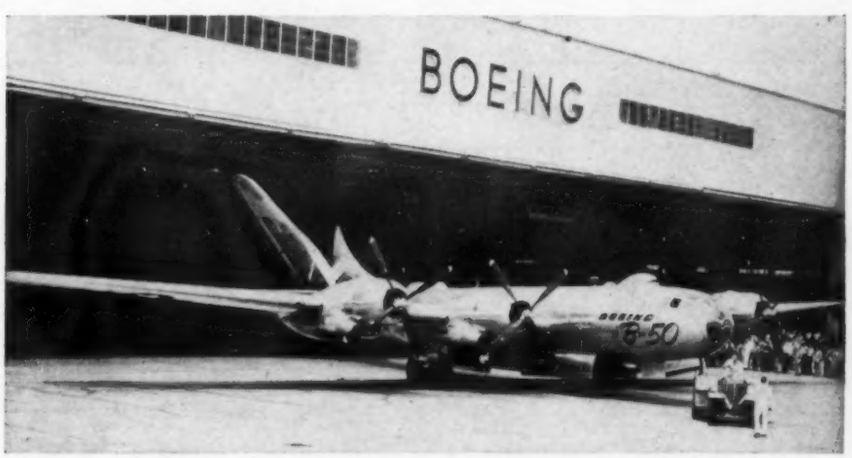
These figures indicate that more than half of surplus machines have been sold, but that's an illusion. The Real Property Division of WAA, sometime, will throw a large volume of machines from unsold, unleased plants into the inventory, and there will be more from Army, Navy, and RFC. The total will be close to $1 million.

Backlog Assailed

Right now, WAA is behind demand with a backlog of just $70 million. That's not a big figure, comparatively, but observers claim any backlog is too big when the nation's production is lagging and industry needs the tools.

A machine tool inventory at Detroit, costing $1 million, showed 80,000 units on hand. A second showed 60,000; a third, 29,000. No machines were sold meanwhile, and no one can explain the discrepancy.

What WAA will do about prices no one in authority can or will say. The Administrator, since March 14, has been sitting on a third fixed-price register, which includes everything but short supply and critical items. The latter would remain under the Clayton formula.



B-50 Leaves Factory in Seattle with its vertical tail folded to clear factory doors. This feature will make hangar space for these air giants less of a problem than it has been for the B-50's predecessors. This is the first of 133 such bombers ordered by Army Air Forces from Boeing

Gaging Business

Caution Creeps In

A tone of caution has crept into the metalworking industries. Buyers are slower placing orders, the relentless drive to get out the goods isn't quite so pressing as it was. There is a noticeable tendency to "wait and see what happens."

▸It is an offshoot of the dip in the soft-goods industries. It is not expected to result in any sizeable diminution in output for months, despite the fact that currently more equipment and other hard goods are being made than are being sold.

Consumer Durables Doing Well

This situation is more typical of machinery and plant equipment industries than of the consumer durable goods industries, such as automobiles and farm implements. Detroit is as optimistic as ever, with the pile-up of retail car orders as great today as at the year's beginning.

▸Farm implement makers are doing a whale of a business. They are looking to foreign outlets to absorb at least part of their increased output.

Materials Supply Easier

Raw materials outlook is about like this: sheet steel and strip is still very hard to get, but other forms of steel are gradually easing.

▸Copper and other non-ferrous metals are causing less anxiety than a few months ago. They are not plentiful; but if you have to get them, you can. Lumber and glass are becoming less a problem day-by-day.

▸Components are steadily improving. Take refrigerators: steel, not motors and compressors, is the determinant of production schedules. The castings situation is better than it was.

New Orders Turn Up

May figures for the machine tool industry reveal interesting patterns. New orders were up some, partly because buyers placed business prior to effective date of higher prices.

▸Cancellations exceeded $5 million, caused by Chevrolet's decision to abandon its light-car project. Total unfilled orders tumbled to $119 million from a previous $128 million.

▸Factory shipments in May ($23 million for 175 companies) were less than in April, but were still somewhat higher than incoming orders.

Export Business Off

Declining trend of foreign business is of deep concern to machine tool builders. Export orders in May comprised only 21% of all bookings, as against 27% in first four months of 1947.

▸While some 30% of all unfilled orders held by the industry are for foreign delivery, builders are gloomy about the outlook for new business abroad. The famine in dollars worries them.

▸In France alone, representatives of U. S. builders have plenty of orders on their books, but cannot secure necessary import licenses.

Tooling Programs to Break

Domestic machine tool sales immediately in prospect look far more encouraging than do foreign sales. Important automotive tooling programs are on the verge of breaking, for one thing. Pending business in the farm implement and tractor field also is impressive.

▸Many buyers are hesitant. They have the money, need the machines, but are hard to push into the order list. Reason: nervousness about the short-term outlook.

▸Best guess for the machine tool industry for the entire year: production of $300 million, new orders of $250 million.

Tool Demand Good

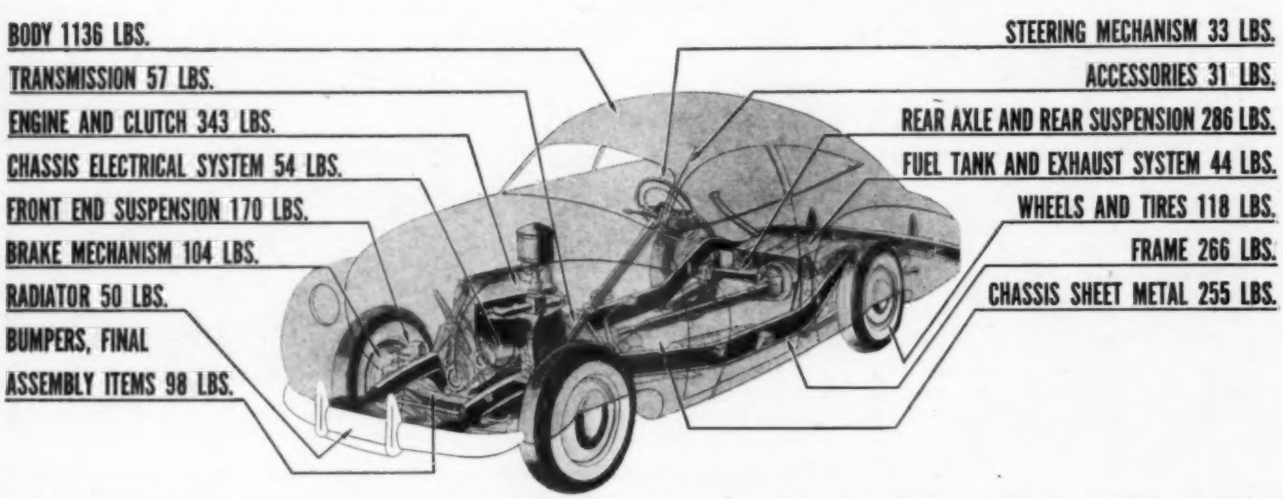
Cutting tool demand stays remarkably good. But it isn't as robust as it was. Backlogs are being eaten into in numerous cases. And deliveries are improving.

▸Twist drills, in general, can be obtained immediately, whereas 6-8 weeks is the rule on taps. Most cutting tool manufacturers are operating on relatively heavy production schedules.

Appliance Production Strong

Household appliance manufacture shows no signs of tapering, except in radios. Output of electric motors continues at a peacetime peak; order backlogs are as large as ever. Materials-handling equipment builders say that business is strong and inquiries are heavy.

3,045 Lb. of Steel Needed to Make One Lower Priced GM Car


BODY 1136 LBS.
TRANSMISSION 57 LBS.
ENGINE AND CLUTCH 343 LBS.
CHASSIS ELECTRICAL SYSTEM 54 LBS.
FRONT END SUSPENSION 170 LBS.
BRAKE MECHANISM 104 LBS.
RADIATOR 50 LBS.
BUMPERS, FINAL ASSEMBLY ITEMS 98 LBS.
STEERING MECHANISM 33 LBS.
ACCESSORIES 31 LBS.
REAR AXLE AND REAR SUSPENSION 286 LBS.
FUEL TANK AND EXHAUST SYSTEM 44 LBS.
WHEELS AND TIRES 118 LBS.
FRAME 266 LBS.
CHASSIS SHEET METAL 255 LBS.

Marginal steel deliveries to auto manufacturers limit production when each car needs more than 1½ tons of steel. Estimates show that a 1947 Chevrolet uses 82 lb. more of sheet steel than pre-streamlined fender models

Criticism of WAA, Production Optimism Keynote MDNA Meeting

CINCINNATI — Highlights of the sixth annual meeting of the Machinery Dealers National Association at the Netherlands Plaza Hotel, June 17-19:

- WAA accused of inefficiency and bungling in disposing of surplus machine tools.
- Predictions that output of durable goods and consumer durable goods will continue at high level.

Harvey H. Goldman, retiring president, charged that dealers could have sold several times the $285 million of surplus machines which they have sold if WAA could have cleared its paper work, made prompt deliveries and showed "some semblance of a business-like approach to the problem."

No one knows, he said, how much more general-purpose equipment is to become available from government agencies, but to clear out plants and warehouses, the government will be forced to dump a certain amount of equipment.

Problems for WAA

"WAA is disturbed about these things: WAA payment of commissions and discounts to dealers for selling surplus machines in active demand; lack of sales effort by dealers on machines in long supply; pressure on WAA by dealers to secure machines they want; growing criticism of site sales, with their attendant confusion and discrimination," according to Mr. Goldman.

Shipment of unusable machines has stifled the outlet for many used machine tools in Latin America, declared William Sharpe, chairman of the standards committee. That is one reason for adoption of standards, he said.

"Foreign buyers have expressed the opinion they will purchase used machines with much more confidence if a standard guarantee is made," he revealed.

Tagging Policy Questioned

"WAA should not be permitted to sell to domestic buyers surplus machines tagged by JANMAT for the strategic reserve," said Burnham Finney, editor, AMERICAN MACHINIST. "These machines should be set aside by the armed services and not be scattered throughout industry where it would be hard to get hold of them in an emergency," he warned.

Mr. Finney expressed confidence in good machine tool demand the latter half of this year. The outlook for 1948, he said, is for a volume comparable with 1947, perhaps better.

The following officers were elected: president, George B. McClennen of Delta Equipment Co.; first vp., Ralph Hochman of Ralph Hochman & Co.; second vp., Joseph T. Weiss Interstate Machinery Co., Inc.; treas., Charles A. Simmons, Sr., of Simmons Machine Tool Corp.

Wilson Attacks Dictatorship In Addressing ASME Meeting

CHICAGO—"We can all have more only if we produce more," asserted Charles E. Wilson, president, General Motors Corp., before 1,200 members and guests of the American Society of Mechanical Engineers at the semi-annual meeting June 15-19.

Warning against the effort to find political short cuts to prosperity without work, Mr. Wilson declared this country needs renewal of faith in a liberal and free competitive system.

Lashing out at dictatorship, he said the American concept of a free society, with respect for individual rights, is the new, liberal and revolutionary concept, and the Marxist ideas are reactionary.

"No way has been found to preserve personal freedom without economic freedom," Mr. Wilson said, "and the way to this lies in the initiative of the millions and not in the dictatorship of the few."

Production Engineering Session

Three papers were presented at a session devoted to production engineering and metal-cutting problems.

William A. Oldacre, president and general manager, and H. A. Erickson, chief engineer, D. A. Stuart Oil Co., presented results of a preliminary investigation of chips resulting from straight form turning a steel bar at six different speeds.

"Torsional Stress Analysis of Twist Drill Sections by Membrane Analogy" was the subject of a paper presented by E. T. P. Neubauer of Kellex Corp., and Prof. O. W. Boston of the University of Michigan.

Certain twist drill sections were shown to be stronger than others. Work was carried out by membrane analogy, using a soap-glycerine film drawn over openings in thin plate.

Machinability Study Reviewed

Prof. K. J. Trigger, University of Illinois, told about results of some tool-work thermocouple temperature measurements taken during lathe turning on NE-9445 steel bars.

MACHINE TOOL SHIPMENTS TO NEW ZEALAND DELAYED

MELBOURNE (McGraw-Hill World News)—Because of delayed British and American delivery schedules, New Zealand machinery importers find it most difficult to use up this year's quota. Deliveries by British firms are not expected to begin before December, and some machine tool makers cannot promise shipment before July next year.

Alternative sources of supply for lathes, screw-cutting machines and general tools have been explored, and import licenses have been issued for Belgian lathes and French machine tools.

U. S.-British Cooperation in the abrasive industries was permanently symbolized by the presentation of a silver cup at a luncheon in New York last month, given by the Grinding Wheel Manufacturers Association. Dr. Frank R. Henry (r), President of the Grinding Wheel Manufacturers Association of the U. S., is shown receiving the trophy from William M. Rowland, President of the Abrasive Industries Association of England

Recipe for Economic Stabilization Presented at MAPI's Annual Meeting

NEW YORK — Federal spending should be used to help combat depressions, and higher taxes should be resorted to as a brake upon booms.

Such a compensatory fiscal policy was advocated by George Terborgh, economist and director of research of the Machinery and Allied Products Institute at the organization's annual meeting at the Waldorf-Astoria on June 19.

William J. Kelly, president of the institute, championed speculative investment as vital to technological progress and said it should be encouraged as a national policy. Such progress is handicapped today, he remarked, by:

1) Federal tax policies which do not permit free depreciation and a full offset for losses;

2) Trade union restrictions on use of machinery in manufacture;

3) Haphazard depreciation and replacement policies of many companies;

4) Lack of understanding by government, industry and the public of the relation of capital goods demand to the business cycle.

Discusses Econom'c Stabilization

In his discussion of a compensatory fiscal policy, Mr. Terborgh concluded that the possibilities of self-stabilization by business and industry are too limited to solve the problem of economic stabilization generally.

By contrast, the federal government's budget of $30 billions or more is "a potential engine of tremendous importance in economic control." It should be used as a regularizing device.

Mr. Terborgh is convinced that "we must resort to surplus financing in booms just as earnestly as we resort to deficit financing in depressions." In practice, however, the policy is likely to figure as a cushion to depressions and will be inadequately used in booms, he said.

Compensatory fiscal policy, as a practical matter, will have to operate mostly in response to developments already visible, he commented, because of "the primitive state of the forecasting art." He admitted that it will not be very effective to counteract short swings in the economy.

Cannot Solve Bad Policies

Such policy, warned Mr. Terborgh, must never be considered a compensation for bad economic policies elsewhere and otherwise. Moreover, he said, "our chief aim must be preservation of the inherent dynamism and vitality of the economic system, without which stability is a poor thing indeed."

Discussing the need for encouraging speculation, Mr. Kelly declared that "we must change our laws, change our attitude of fear and jealousy that one may succeed in extraordinary measure to one of hope that he will do so."

Speculative Investment

He pointed out that as technology advances, cost of experimentation increases. As problems of marketing becomes more complicated, the problems of attaining commercial success from new developments are greater. Likewise, the burden of risk-taking becomes too heavy to be borne by a single individual. Hence speculative investment, emphasized Mr. Kelly, provides the means for distributing the risk.

"Once again," concluded Mr. Kelly, "we must lead our young men with the inspiring torch of Edison, Ford and Westinghouse. When they succeed, we must reward them with fame, and with cash they can keep and apply to newer risks of their choice."

"Right to Manage" Urged

H. W. Story, vice president, Allis-Chalmers Mfg. Co., urged manufacturers to protect the "right to manage" in their union contracts. He cited approvingly the Allegheny-Ludlum Steel-United Steelworkers contract reading: "management has the right to manage plants except insofar as that right is not limited by other provisions of this agreement."

He reminded members that union contracts are legal documents in which loose language, vague terms and broad generalizations may be misinterpreted by referees or the courts when disputes arise.

Machinery for Emergencies

Machinery and other plant equipment should be set aside and key war plants preserved as a safeguard in a future emergency, declared Vice Admiral Edward L. Cochrane, chief of materials division of the Office of the Assistant Secretary of the Navy. Such action is of equal importance with stockpiling of strategic materials.

Herbert H. Pease, president New Britain Machine Co. and president of the National Machine Tool Builders' Association, discussed the desirability of a free depreciation policy by the U. S. Treasury, permitting flexibility in deciding rates.

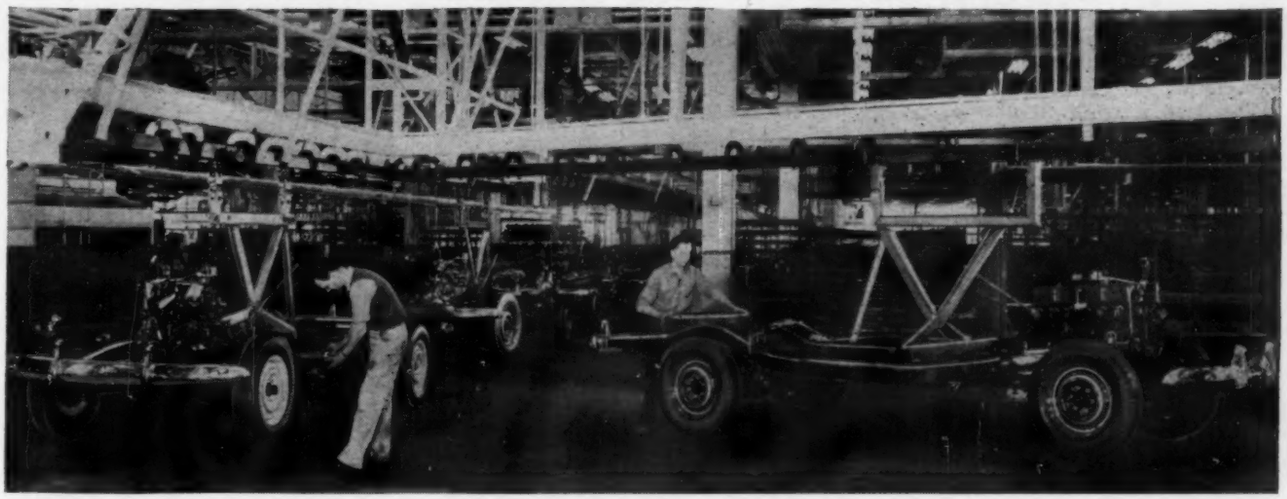
Utility Tractor, adapted for use by contractors, farmers, and industrial plants, features an automatic clutch, all-steel welded frame, pivoted front axle suspension and individual rear wheel brakes. Made by Lincoln Tractor Co., the machine weighs 750 lb. The 6 hp. aircooled, gasoline engine, which weighs only 56 lb., was built by Salisbury Motors, Inc.

5-Station Packaging Machine

CINCINNATI — A five-station machine, developed for the packaging industry by The American Tool Works Co., and known as the "Trans-Bo-Matic," is undergoing trial tests in producing transparent, rectangular boxes from sheet plastic materials automatically.

Detroit

CHEVROLET USES OVERHEAD LINES IN NEW ASSEMLY PLANT . . . FORD LOOMS AS PACESETTER . . . CAR, TRUCK PRODUCTION HOLDS



Overhead Assembly features operations at the new Chevrolet plant in Flint. Shown is a switch point on the monorail overhead assembly line. Chassis leave the single line for dual lines, preparatory to the body drop

Assembly on Modern Lines

Chevrolet opened its newest assembly plant to operations and inspections late in June. Located at Flint, the new factory is geared to produce 80 cars and trucks an hour over lines which represent the last word in manufacturing technology.

Car and truck chassis are suspended from a monorail conveyor, rather than moved along floor conveyor. This permits assembly work to be done at bench level, and also allows right-side-up assembly of the chassis, with free access to it from all sides. About four miles of overhead lines are spread through the plant; only a few thousand feet are on the floor.

The chassis frame is completely assembled in the assembly plant. A battery of welding machines and various types of riveters do this work.

Considerable flexibility of movement is possible on the new monorail line, through what Chevrolet engineers call a "power and free" system. At periodic intervals along the line the conveyor power chain loops away from the rail, leaving an area along which the assembly is pushed by hand. At these points operators can stop the work to catch up, if they are behind, or can shove it through immediately if the job is ahead of schedule.

The 10-building facility, with floor area of 1,250,000 sq. ft., has three final assembly lines, one of them for trucks. The two passenger car lines, incidentally, stem off a single chassis line. The final assembly conveyors operate at half the speed of the chassis line to permit the satisfactory completion of the time-consuming work done after the body is mounted on the chassis.

Retooling at Rouge

Indications are fairly firm that one retooling program of consequence on 1948 automobiles will come out of the Rouge. Ford Motor Co. has some large-scale plans, as evidenced by the publicity-slanted observations of officials that the 1948's will be as far ahead of the 1947's as the model A was ahead of the model T.

Although this comparison is an exaggeration of sorts, the 1948 Ford may definitely prove to be the pacesetter for the popular price field. It embodies an almost complete new set of dies and a great number of new machines for mechanical changes.

To date comparatively little of this work has been released although millions of dollars worth of tooling has been authorized—Henry Ford II was quoted late in June as saying $17 million had been released thus far. Actually, it appears this sum may already have been approved and allocated, but releases are going through in portions, rather than all at once. Meanwhile, Ford's own tool and die rooms are actively at work, although not at the peak employment of previous years.

Ford is not yet decided on whether an automatic transmission will appear on any of the passenger car lines. Several have been tested and bugs found in all of them.

Henry Ford II reported the company has 1,700,000 orders on its books today for cars and trucks and he foresaw no slow-up in demand until sometime in 1949. He expects capacity production next year.

Super Plating Plant

Pontiac Motor Div. has installed what is reported to be the largest individual plating plant in the world, an entirely automatic operation contained in a 660 by 50 ft. building. Indicative of the size is the fact that the nickel section, including 14 different tanks, contains 65,200 gal. of solution; and tank capacity of the entire project is about 500,000 gal. Incidentally, the chrome tank, a 15,700 gal. behemoth, is divided into two compartments, allowing two lines of work which may be operated at different cathode densities.

Electrical energy for the plating procedures is supplied from 22 Chandeysson motor generator sets ranging from 5000 amp. at 6 volts to 15,000 amp. at 12 volts, with a total capacity of 285,000 amps.

Temperatures of the heated solutions and the levels of all plating tanks, cleaning tanks, and power wash machines are automatically maintained. All rinse sprays operate intermittently as the work is being raised from the tank, by means of remote control switches, relays and timers. The entire job was built, engineered, and installed by Geo. L. Nankervis Co., Detroit, and the plating machines were built by Meaker Manufacturing Co., Chicago.

Lags Temper Industrial Activity In Buffalo; Several Firms Expand

BUFFALO—A survey of metalworking activities in this area shows some phases booming, and others lagging.

The area's three steel producers, Bethlehem, Republic and Wickwire-Spencer have all the business they can handle. The construction industry and foreign buyers have closed any gaps developing in demand for consumer steel.

The situation is less bright for foundries. Many are noticing lags in business, attributed to some extent to the unloading of War Assets Administration's surplus material worth hundreds of millions of dollars.

Foundries running low on business have been turning out castings for a product in short supply. WAA released its supply of the commodity, and supply is no longer short.

Non-ferrous Scrap Weakens

Demand for steel scrap is tremendous and steel mills continue capacity operations. Lower non-ferrous scrap prices indicate weakness in this segment. Ingot makers report orders for brass, copper, lead, and other metals have tapered recently.

The booming automobile industry is providing a heavy backlog of orders for many metalworking firms.

Although the employment trend in metal plants is still slightly upward, there are indications of increased reservation by employers with respect to plans and commitments. For the most part, hiring is for replacement purposes, rather than expansion, except for the electrical machinery industry.

Electric Operations High

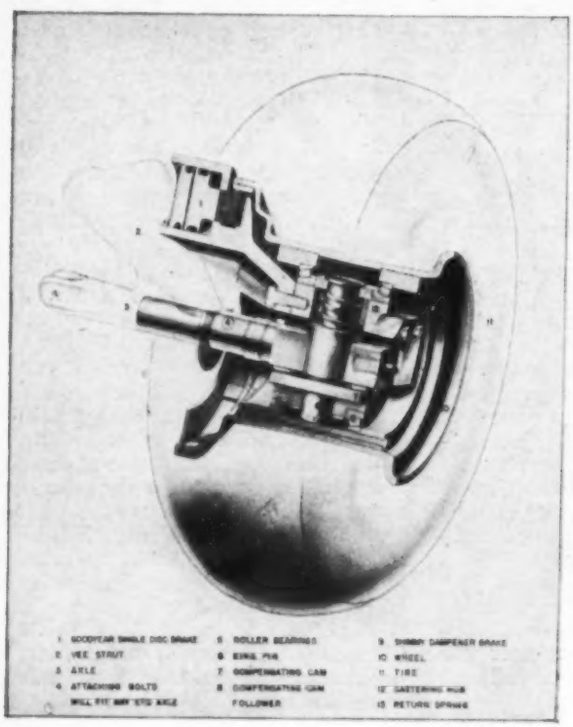
Westinghouse and Western Electric have both established Buffalo plants since the end of the war. Westinghouse is steadily building up operations at the airport plant it purchased from Curtiss-Wright Corp. Western Electric recently bought the former Kenmore plant of Curtiss-Wright where it had been manufacturing telephone equipment under lease.

Bethlehem Steel has a $24,400,000 expansion program underway in its Lackawanna plant, including new finishing mill facilities.

Other Expansions

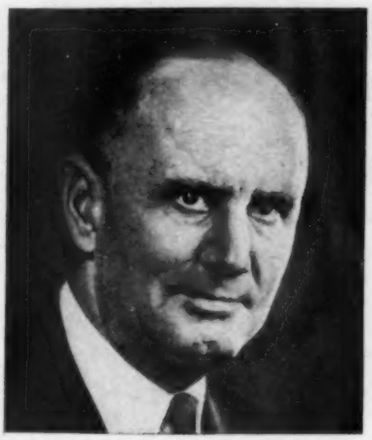
Trico Products Corp., a large producer for the automobile industry, has an $8,500,000 expansion program in blueprint form and is awaiting favorable conditions. Operating at peak levels, the firm is gaining added business through development of new automotive products.

American Machine & Foundry is spending $2 million in the former Buffalo Arms Corp. plant in Cheektowaga, where it is producing automatic pin spotters. American Radiator has a $350,000 expansion program on the books.



Cross-wind Landing Gear for airplanes promises to cut airport construction and maintenance costs by 50% or more within the next few years. The caster wheel gear, detailed in the accompanying diagram, permits takeoff and landing in all wind directions making only one runway necessary. Conversion of existing planes calls only for a substitution of wheels—the swivel mechanism is inside the hub. Cost is estimated at $150 for light planes, $1,000 for transports, and $300 for medium types

EASTMAN KODAK PRESIDENT HEADS MUNITIONS BOARD



Thomas J. Hargrave

WASHINGTON—Thomas J. Hargrave, president, Eastman Kodak Co., today heads the Army-Navy Munitions Board. Named by President Truman, Mr. Hargrave succeeds Richard R. Deupree as chairman.

Reconstituted by the President in August, 1945, the board formulates plans for industrial mobilization in the event of an emergency, has charge of stockpiling strategic and critical materials, and coordinates War and Navy procurement.

AMA Speakers Stress Teamwork Between Design and Production

NEW YORK—If international control of atomic power is successful, industrial management faces the brightest future ever faced, John M. Hancock, partner of Lehman Brothers, told the American Management Association's conference on general management problems at the Waldorf-Astoria Hotel.

Any final plan, he warned, must provide protection against aggressive use of the atom bomb against the U. S. He said that "if a war comes, I am sure the atomic bomb is going to be used."

L. Clayton Hill, works manager of Eagle Pencil Co., advocated integration between product design and process determination for increased productivity. He urged cooperation between engineers designing a product, and tool and process men who determine how it should be made.

Mr. Hancock was reelected board chairman. Alvin E. Dodd, president since 1936, was reelected. Among vice presidents named was George S. Dively, who will take charge of the production division.

Washington

WAA INVOICING HELD COSTLY . . . SURPLUS MAY INCREASE VALUE OF GREEK, TURK LOAN . . . BUSINESS TAXES STUDIED

WAA Paper Work

No one knows for sure, but some WAA officials claim reported recovery of 40% on machine tool sales is illusory. Warehousing, handling, cartage, commissions, etc., result in losses on all sales, they say. Primary object is to (1) put the machines in hands of industry; (2) stop storage costs; (3) remove them from the industry economy. Why not then stop all the costly invoicing, and just sell them, with a sales slip and checks for the record, is the question being asked.

Defense of Surplus Sales

WAA chiefs quickly cited some minor machine tool price increases to support their contention that surplus sales are not cutting into sales of new production. However, they admitted if they were in the industry, they might agree with it against surplus policy.

Steel Distribution Hit

The Small Business Subcommittee charges the steel companies have failed in their promise of equitable distribution by concentrating their shipments in areas of lowest freight absorption.

A case in point recently was the complaint of the Pressed Steel Car Co., Inc., that a portion of its plate shipments had been shut off, while the steel companies showed they had evceeded their quotas in shipments of plates, specifically, and all steel to the railroad equipment industry.

Surplus to Greeks, Turks

If War Assets chief counsel is right in claiming Greece and Turkey have a "super priority" on surplus property under the $400 million grant can be increased to almost any grant can be increased to almost any figure through low prices or even give-away of the surplus.

Greeks and Turks want some production, construction, railroad, electrical equipment, but mostly weapons: tanks, guns, airplanes. War Assets has some airplanes, but Army and Navy will dole out the shooting iron. The Near East program could be tremendous.

Foreign Surplus Ominous

Associated equipment industry and distributors have given up trying to find out when and how much construction equipment will be returned here by foreign liquidation commission, and what WAA has on hand here.

Purchases of surplus in China and the Philippines are reported shipping it back here for American dollars. An estimated two billion dollars worth is still in Germany. Industry and dealers went along with Government view that the stuff was needed here. Now, they fear a deluge that will damage their market.

Tax Problems Probed

Truman's successful veto means there will be no tax relief until July 1, 1948, or it could be retroactive to Jan. 1. Some business tax problems being studied are: corporate rates, relief for small corporations, stock options, double taxation of dividends, and changes in corporate reorganization provisions, and revision of excise tax system.

Optimism for Tucker

Washington brokers, informed on SEC, say adverse publicity on Preston Tucker's stock registration statement will not prevent ready sale of his debentures.

He has $500,000 cash on deposit for down payment of rent on RFC's Dodge-Chrysler plant, and RFC probably will give him extension if it becomes necessary. Brokers admit Tucker erred in failing to report all facts to SEC, but they believe much of his trouble is caused by Michigan (Detroit) politicians, including Sen. Homer Ferguson.

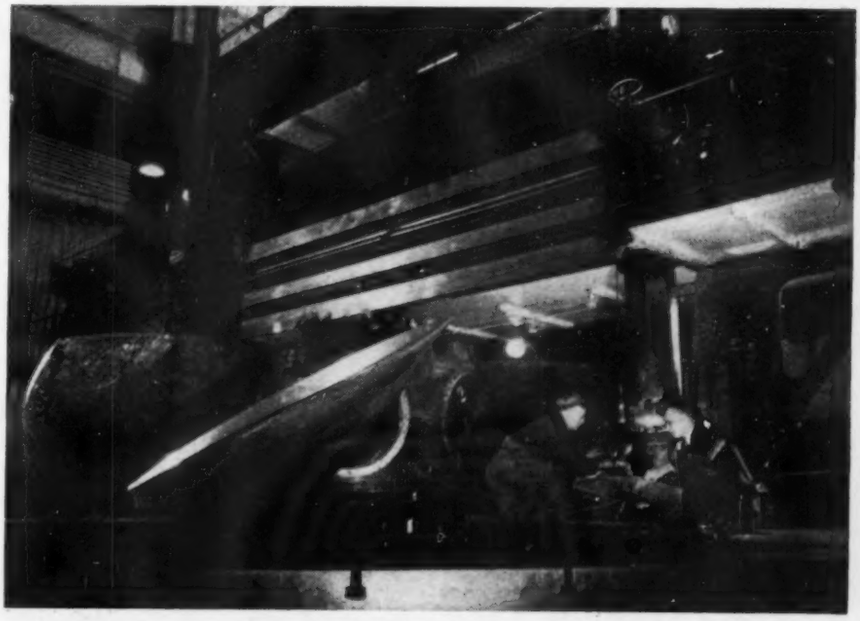
Identification for Munitions

A super catalog of standard identification numbers for munitions and equipment components and parts covering all Federal procurement agencies, soon will be shown to House Appropriations Committee, with a request by Treasury procurement division for funds to run it.

Supporting its project, Treasury will cite wartime combat unit losses while waiting for components they already had but couldn't identify readily.

Disposal Agency Proposed

Because huge and growing Federal agencies are constantly discarding volumes of obsolete, worn out, and excess real and personal property, Administration is considering establishment of a permanent surplus disposal agency, probably an extension of War Assets Administration.



Kaintuck Wheel—Cast steel adjustable blade runner for the fifth Kentucky Dam turbine is checked for spherical turn at the West Allis Works of the Allis-Chalmers Mfg. Co. by James M. White, manufacturing vice president, and operator Leonard Ristow. The 21½-ft. dia. runner goes in a 44,000-hp. turbine under 48 ft. head at 78.3 rpm. It is being machined in a 40-ft. boring mill

Steel Supply-Demand Balance May Come Fast, Analysts Say

PITTSBURGH—A number of steel analysts now are veering to a theory that when the supply and demand balance develops, it will come suddenly. The one possible exception will be in sheets.

If the steady flow of tonnage continues, only imbalance of inventories will prevent supply from meeting quantitative demand.

Nails are a case in point. Movement of nails is in excess of peak peacetime demand. Distributors are sending out monthly quotas, but could dispose of 10 times as many kegs. If pipe lines were filled, demand would be limited to the extent of actual consumption, and there would be no nail shortage.

Soft Spots in Sheets

Sheets are difficult to evaluate because of their varied use. Quota consumers of big sheet mills are, in some instances, finding soft spots and selling excess tonnage to the "gray market." As long as they get 10¢ per lb. for cold-rolled sheets in the "gray market," they will take their full quotas from the mills.

Shapes and plates in the heavy-rolled steel products line are still tight. The 1947 reports of the American Iron and Steel Institute indicate allotments of raw steel to these products of lesser profit to the steel companies are consistent with production of ingots month by month.

Thus, there is more than enough demand for the steady output of finished products which ensue.

Pipe Demand Varies

Some pipe items are in extraordinary demand with unfilled orders sufficient to last for years, while other grades are close to balance.

At this writing, the coal situation has not been resolved. Steel company coal piles are of such small size that a prolonged stoppage of coal production will have near-term repercussions in steel output. This is one factor behind recent strength in quotations of scrap steel.

Job Outlook in Machine Shops

WASHINGTON—A 28-page booklet entitled "Employment Outlook in Machine Shop Occupations" has been prepared by the U. S. Department of Labor, Bureau of Labor Statistics. Job prospects, duties, training, earnings and working conditions are covered in the report, which gives detailed information on opportunities for all-around machinists, tool and die makers and machine tool operators.

Simple Servicing of jet engines on Northrop Flying Wing YB-49 jet bombers is speeded by built-in track and hoisting arrangement, making it a matter of minutes to lower and raise engines. Engines fit in narrow, close-quarter bays, then slide up and forward on rollers along a built-in track. Stabilizing bars link to engine back of center. Although buried in airfoil of wing itself, the YB-49's eight engines are almost as easy to reach and service as jet engine on modern fighter. YB-49 develops about 32,000 lb. thrust

Machine Tool Session Highlights Apprentice-Training Conference

MANCHESTER, VT. — The machine tool industry's section meeting proved a highlight of the three-day Eastern Seaboard Apprenticeship Conference here June 12-14. Industrialists, labor representatives, and government agents of the Apprentice-Training Service from all sections of the country attended.

Norman D. McLeod, president, Abrasive Machine Tool Co., E. Providence, R. I., was chairman of the machine tool session, and reviewed the advances in apprenticeship made by New England manufacturers.

Labor's Interest Cited

Labor's interest in the training of future craftsmen was emphasized by A. J. Hayes, general vice president, International Association of Machinists. He recommended apprenticeship as a means of attacking waste of human talents and resources. Failure to develop skills and realize maximum productive potention of qualified workers is neither economically nor socially justifiable, he asserted.

After pointing out the many apprenticeship agreements of his organization with machine tool manufacturers, Mr. Hayes said there is no universal pattern for introduction of an apprenticeship program. "A suitable and effective system must fit the requirement of the individual factory and be adapted to local conditions and the requirements of industry," he stated.

Springfield Course Reviewed

John Morton, director of industrial relations, Fellows Gear Shaper Co., presented a paper prepared by Everard Stubbs, development engineer of Fellows, who was unable to attend. He reviewed the Springfield, Vt. Co-operative Course, where students work alternate periods of five weeks in school and shop.

"The educational value of having a stream of selected boys moving through our shops on a planned time table, changing from department to department, for definite periods, has a great influence in improving the teaching ability of foremen, which faculty is so important to the well-being and advancement of all factory personnel," he said.

Co-op Grads on Panel

A panel section composed of men who graduated from the Springfield Co-op Course and have advanced in industry was a highlight. Participants included John M. Pierce, director of Co-op training at Springfield; Clarence A. Lindsay, machine shop teacher for first-year Co-ops; Ray Hronek, now master mechanic at Jones & Lamson Machine Co.; George Morin, chief sales engineer, Jones & Lamson; Alan Stubbs, foreign sales manager, Bryant Chucking Grinder Co.; Hugo Lakso, assistant superintendent, Bryant Chucking, and William Hadwen, foreman, Fellows.

E. H. Miller, general manager of Fellows, was vice chairman, and Reuben Peterson, Jr., general manager, Associated Industries of Rhode Island, was discussion leader at the forum session.

Subpoena Powers in New Labor Bill Presents Problems for Management

WASHINGTON—Management will face many new problems, even new risks, under the Taft-Hartley Labor Law. It is a double-edged sword that cuts both ways.

It will take years to get the feel of the new rules and clarification of many debatable provisions. True, the law lays a heavy hand on labor organizations. But management, too, comes in for its share of regulation. It can't sit idly by.

Counsel with "Czar" Powers

Take, for instance, the general counsel of the National Labor Relations Board. Here is the key man. The law makes him a "Labor czar." This official acts in the name of the board. He is neither appointed by, nor beholden to, the board but may dominate it. He:

- 1. Decides whether there is a basis for issuance of an unfair labor practice charge
- 2. Can issue subpoenas for witnesses and records and go on a "fishing expedition" if he likes. At the request, say, of Walter P. Reuther, UAW-CIO president, he could make an automobile manufacturer produce its profits and production records if he felt it was pertinent to an issue in dispute
- 3. Can obtain injunctions against jurisdictional strikes and boycotts, and also against any unfair labor practices

Heavy Penalties Imposed

Employers who violate restrictions on welfare fund payments or check off union dues without a written assignment from the employee may be imprisoned for one year and fined $10,000.

More than under the Wagner Act, employers, as well as unions, are forced onto the NLRB treadmill at almost every turn. Even with a much larger staff, which will be necessary, NLRB will be lucky to keep up with the increased workload.

Cases will be delayed even more than they have been in the past. If this doesn't upset working conditions in a plant, the heavy traffic of NLRB poll takers may do it.

Elections in Volume

Here are some of the elections which NLRB may be required to conduct in a single plant:

- 1. Among all workers to determine bargaining agent
- 2. Among professional workers to ascertain whether they wish to bargain separate from the others
- 3. The same for craft workers
- 4. Among plant guards, who may not be included in other units
- 5. Among all workers as a prelude to a union shop
- 6. On the final offer of management in a "national emergency" dispute

In addition, there may be run-off elections. Also, elections seeking to reject an existing bargaining agent or discontinue a union shop agreement.

Portal Act Developments Clear Compliance Factor for Employers

WASHINGTON—Employer liability under the Fair Labor Standards (Wage-Hour) Act was not entirely cleared up when President Truman signed the Portal-to-Portal Act last May 14.

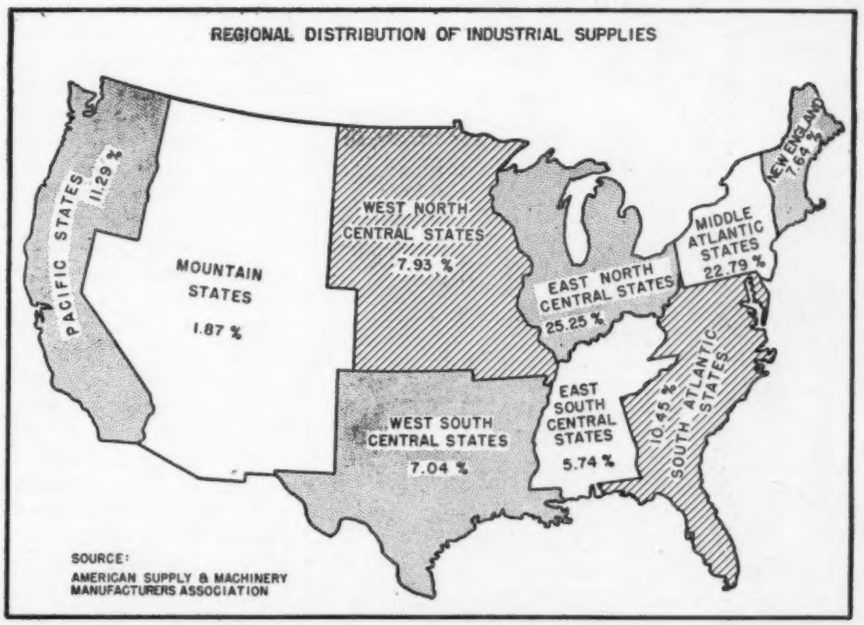
These developments have since taken place:

- 1. Wage-Hour Administrator W. R. McComb has named a labor-management advisory committee to make recommendations for revising the regulations governing the exemption of certain "white collar" workers from the wage-hour law. Later, a public hearing will be held on the matter.
- 2. All employers subject to the wage-hour Walsh-Healey Public Contracts laws are put on notice that they are responsible for compliance.
- 3. A federal judge in Los Angeles refused to dismiss an AFL suit against the California Shipbuilding Corp., in which the union is seeking pay for firemen and guards who are required to report 15 to 30 min. before their shifts begin.
- 4. A Federal District Court in Northern Texas held the new portal pay law to be constitutional in dismissing a suit against Eagle-Picher Co. for pay for walking and clothes-changing time.
- 5. The U. S. Supreme Court remanded two wage-hour cases back to the lower courts for reconsideration in the light of the "good faith" defense allowed employers by the portal pay law.

NPA Engages in Three Studies In Collective Bargaining Field

WASHINGTON—Under the stimulus of Clinton S. Golden, labor statesman and former assistant president of the CIO's Steelworkers, the National Planning Association in Washington hopes to make the causes of labor (peace) share a place in the spotlight with the causes of labor (strife).

Its proposed study of 15 plants having exemplary labor relations will be the third in the field of collective bargaining, none of which has been completed.


REGIONAL DISTRIBUTION OF INDUSTRIAL SUPPLIES
PACIFIC STATES 11.29 %
MOUNTAIN STATES 1.87 %
WEST NORTH CENTRAL STATES 7.93 %
WEST SOUTH CENTRAL STATES 7.04 %
EAST NORTH CENTRAL STATES 25.25 %
EAST SOUTH CENTRAL STATES 5.74 %
SOUTH ATLANTIC STATES
MIDDLE ATLANTIC STATES 22.79 %
NEW ENGLAND 7.64 %
SOURCE:
AMERICAN SUPPLY & MACHINERY MANUFACTURERS ASSOCIATION

Typical of the Products included in this 1947 survey of industrial distribution are abrasives, chucks, portable electric tools, gear cutters, metal cutting tools, milling cutters, material handling equipment, machine tools, power transmission equipment, precision tools, reamers, screw products, taps and dies, and twist drills. Only slight changes are noted in comparison with the 1940 survey

Foreign Report

(BASED UPON REPORTS FROM McGRAW-HILL WORLD NEWS BUREAU)

Austria's Metalworking Situation

VIENNA — Austria's metalworking industries should be able to gain a position of new importance in Central Europe as soon as conditions favorable to general economic recovery are fulfilled.

Under German domination, Austria's iron, steel, aluminum and engineering industries were expanded and modernized considerably. This was offset greatly by the ravages of war and Russian policy of stripping "German assets" from Austrian plants.

Barter has enabled much rehabilitation of plants. For example, Wertheim AG, in the Soviet sector of Vienna, has provided hoists for Heid AG, Austria's largest machine tool manufacturer, located in the Soviet zone, in exchange for lathes. Heid also has exchanged lathes for antifriction bearings from Sweden and gear-generating equipment from Switzerland.

Following are summaries of the present condition and outlook of certain key metalworking industries in Austria:

Machine Tools: Manufacture of machine tools was at a virtual standstill until late in 1946.

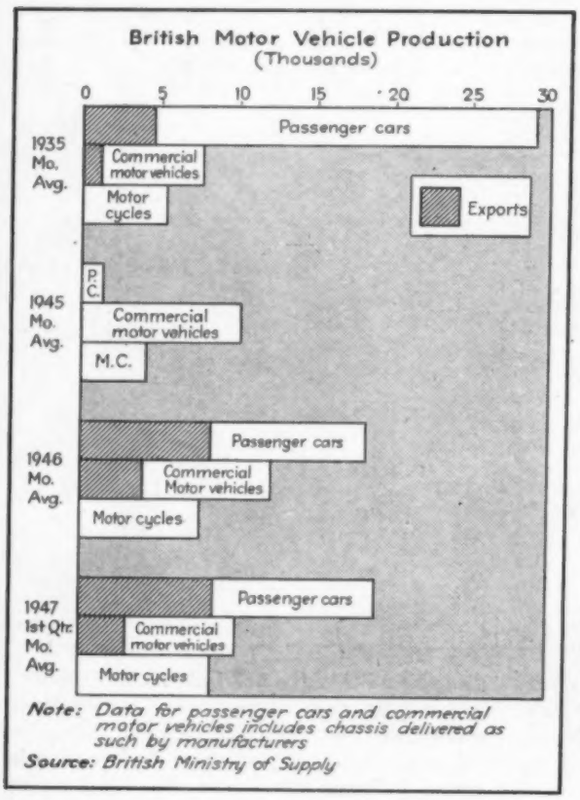
Heid AG produced a few lathes during the first half of 1946, reached a high point of 15 lathes produced in Sept., 1946, and didn't exceed that figure for the rest of the year. March saw improvement, and in April the firm produced 15 medium capacity production lathes of advanced design in addition to a number of variable-speed machinery drives with magnetic clutches.

A. Petravic and Co., in the U. S. sector of Vienna, has done much better than the rest of the machine tool industry. Forced to concentrate on medium-sized drill presses, only one of its formerly varied line of products, it has been turning out between 100 and 200 machines monthly. The firm's production of hand power drills has been increasing, notably from 85 in March to 125 in April.

Bearings: At present, production of bearings represents the quickest way for Austria to turn steel into foreign credits. Considerable emphasis is placed on production at the Steyr-Daimler-Puch AG plant. Provided productive facilities are reinstated and raw materials assured, a monthly production target of 350,000 bearings likely will be reached by the end of the year.

Automotive: Productive capacity of the automotive industry was hit hard by Russian removals. It has been hampered further by dependence on foreign sources for important components and tires. Consequently, the 1946 record of industry was not impressive but managed to prevent a breakdown in Austria's motor transport service.

Locomotive and Rolling Stock: The most significant postwar development in railroad equipment centers around the Graz diesel locomotive factory of Simmering—Graz—Pauker, located in the British zone. Repair of bomb damage has restored facilities for monthly production of ten 900 hp. diesel locomotives and operations are to begin as soon as required supplies of steel, electric power and raw materials are ready.



Note: Data for passenger cars and commercial motor vehicles includes chassis delivered as such by manufacturers

Source: British Ministry of Supply

British Exports of motor vehicles are just about double the 1935 rate, while total passenger car production is only 63% of what it was 12 years ago. This follows the current British policy of exporting as much as possible at the expense of domestic consumption, if necessary, to improve its import-export balance. 1946 monthly production of passenger cars rose from a low of 6,319 in January to a peak of 26,827 in December. If this trend continues throughout 1947, total production for the year should at least equal 1935 output. Commercial vehicles and motorcycles have already exceeded 1935 production

Sweden, Denmark Seek to Push Production of Cars for Export

GENEVA—Postwar shortage of foreign currencies, especially dollars, which compels many European countries to restrict imports from overseas, is bringing about an intensification of an effort to develop production of automobiles in the Scandinavian countries. The situation in Sweden and Denmark:

SWEDEN — The Government decided and made effective the middle of March that the total number of automobiles authorized to circulate in the country could not be higher than the prewar figure. The measure aims, indirectly, to prevent large-scale importation of foreign cars, without direct action against such imports.

Though prices of cars have about doubled since 1939, there is now a great pent-up demand for cars in Sweden. A. B. Volvo of Goteborg, largest producer, turned out 6,525 vehicles in 1946, instead of the 20,000 it planned. The firm, run on American methods, is enlarging its factory considerably.

DENMARK — Most automobile plants work at full capacity. In 1936, the Danish automobile-export reached 35 million krona, and is going to pass this total considerably during the present year. Virtually the whole of Danish production is destined for export. The main customers are Sweden, Norway, Iceland and Poland.

Chicago Area Production Holds Despite Decrease in Backlogs

CHICAGO—Both employment and production are holding up in the Chicago area. Order backlogs have declined, however, and the inventory picture has some companies worried.

On the other hand, decline in backlogs is tempered by a speed-up in delivery of supplies. Buying policies of metalworking companies have turned conservative and many are on a "hand-to-mouth" basis.

Plants officials surveyed described corrective reactions that have taken place as "healthy." They say backlogs of orders equal to many months of output are generally an illusion.

Bankers Unabashed

Chicago area bankers, who have financed much of the increased production, are keeping a sharp eye on plant inventories. They assert that inventories are "spotty" and "out-of-balance," but are not fearful.

One leading banker said, "Much of the piled up inventories is caused by supply difficulties. Manufacturers have had to take what they can get when they can get it." He noted that inventories representing partly completed goods are rapidly being adjusted.

Delay Costs $30,000

One specific instance is cited to explain unbalanced inventories. Allis-Chalmers was prevented from delivering a complex piece of machinery ordered by TVA because one casting was defective. As a result, under the purchase agreement, the delay cost Allis $30,000.

Since that time, Allis has taken no chances. It keeps a large supply of the necessary parts—perhaps equal to two or three years' ordinary needs—on hand, thus swelling inventories.

The need for stocking up, however, is vanishing, and bankers say the close tab kept on inventories is beginning to show up in smaller accumulations. One metalworking firm that had 31 scarce items on its list last November now has only three.

Survey Shows Backlog Drop

In a month-to-month comparison of a variety of manufacturing firms in the Chicago area, it was found that order backlogs are falling rapidly. At the end of the latest month, for example, 57% of the companies reporting said backlogs had declined from a month earlier; 38% said they were the same; and only 5% reported higher backlogs.

The drop is attributed to reduced rate of new orders (shipments are exceeding new orders); cancellation of existing orders; production outpacing new orders.

Names in the News

W. C. Johnson

W. A. Roberts

William A. Roberts and **William C. Johnson** have been appointed executive vice presidents of the tractor and general machinery divisions, respectively, of Allis-Chalmers Mfg. Co., of Milwaukee. They were formerly vice presidents in charge of their divisions. **Marshal L. Noel,** general sales manager of the tractor division, was also named a vice president, while **J. L. Singleton,** former manager of the general machinery division's district sales offices, is now vice president and director of sales for the division.

John Oswald has been appointed to the newly created position of executive engineer in charge of styling and body engineering for Ford Motor Co., Dearborn, Mich. He was formerly assistant to the vice president in charge of engineering of General Motors Corp. **Richard E. Robers,** who recently joined Ford after 9 years with General Motors, has been named director of management relations.

Hugh J. Fraser, vice president of The International Nickel Co., Inc., has been placed in charge of all plant operations in the United States. **John A. Marsh,** former assistant general manager of the Huntington, W. Va., works, has been appointed Mr. Fraser's assistant.

William F. Bottiglia has been named general manager of the J. & S. Tool Co., East Orange, N. J., makers of precision form dressers.

Clifford M. Sayre has been appointed general works manager of the Sturtevant Div., Westinghouse Electric Corp. with headquarters at Hyde Park, Mass. He was formerly works manager of the Joshua Hendy Iron Works, Sunnyvale, Calif.

F. W. Mesinger, vice president, was recently elected to the board of the Norma-Hoffman Bearings Corp., Stamford, Conn. He has been with the corporation 28 years and is in charge of sales.

Henry W. Kayser has been named supervisor of development engineering for the Falk Corp., Milwaukee, with which he has been associated since 1931.

O. V. Greene, formerly manager of Tool & Alloy Steel sales, has been appointed assistant general manager of sales of The Carpenter Steel Co., Reading, Pa. **H. S. Potter** has been promoted to manager of tool steel sales; **W. M. Loos** to manager of stainless steel sales; and **J. W. Thompson** to manager of alloy steel sales. Each of the latter three men was previously assistant manager of his respective department.

Harry T. Burke, chief engineer of the E. W. Bliss Co. Brooklyn plant, has been appointed assistant to the general sales manager with headquarters in Detroit.

Richard T. Spear has been named regional sales manager for the middle Atlantic area for All-State Welding Alloys Co., White Plains, N. Y.

Ralph V. Davies

R. C. Somerville

George J. Stanley has retired as vice president and general sales manager of the Aluminum Co. of America. He has been succeeded by **Ralph V. Davies,** former assistant general sales manager in charge of sales engineering and development. **Robert B. McKee** and **Donovan Wilmot,** former assistant general sales managers, have also been promoted to vice presidents.

R. C. Somerville has been appointed general sales manager of the Plymouth Div., Chrysler Corp., Detroit. He joined Plymouth in 1931 and for the past three years has served as assistant general sales manager.

George J. Easter has been appointed director of research of the Electro Refractories & Alloys Corp., Buffalo, succeeding **Milton H. Berns,** who is now director of technical service. Mr. Easter was formerly manager of research and development for Carborundum Co., Niagara Falls, N. Y.

Rudolph Furrer

W. Fosh Dew

Rudolph Furrer has been elected vice president in charge of engineering for the American Car & Foundry Co., New York. He succeeds **Edmund D. Campbell**, who recently retired after 44 years with ACF. Mr. Furrer, a research and development engineer for many years, served during the war on the War Metallurgy Committee and as a special consultant in Ordnance research and development.

W. Fosh Dew has been named sales manager of the Clearing Machine Corp., Chicago. Before joining Clearing in 1940, he was associated with the Toledo Machine & Tool Div., E. W. Bliss Co. for 20 years.

W. N. Springer has been appointed purchasing agent of E. C. Atkins & Co., Indianapolis, Ind.

BUSINESS ITEMS

The Fellow Gear Shaper Co., Springfield, Vt., has opened an eastern sales and service office in Room 7706, Empire State Bldg., New York. The office will handle both Fellows gear manufacturing equipment and Fellows Leominster plastics injection molding machines and accessories.

Westinghouse Electric Corp. has formed two new electronics sections to handle engineering and sales for the Buffalo Divisions. **Edwin H. Vedder** has been named manager of electronic control engineering, while **Russell W. Staggs** is manager of electronic control sales.

Carboloy Co., Inc., Detroit, has appointed **Wiley-Hughes Supply Co.,** Inc., Spruce St. and New York Ave., Trenton, N. J., as its authorized distributor in central New Jersey.

Pittsburgh Steel Co., Pittsburgh, has acquired the **Johnson Steel & Wire Co.,** Worcester, Mass., and will operate it as a wholly owned subsidiary with **Charles D. Johnson** as president.

The Thomas Steel Co., Warren, Ohio, has opened a district sales office at 20 Pine St., New York, with **Hugh J. Smith** in charge.

The Vulcan New England Co., an industrial consulting organization, has been established with headquarters in West Hartford, Conn. **Roger Tarpy,** formerly chief tool engineer for the U.S. Time Corp., Waterbury, Conn., is managing director.

The Acme Tool Co. has moved to its own building at 71 West Broadway, New York.

Joseph T. Ryerson & Son, Inc., has opened a sales office in Syracuse, N. Y.

The Black & Decker Mfg. Co. has opened a new service branch in Charlotte, N. C., at 117 E. Ninth St.

The Howard Engineering & Mfg. Co., Cincinnati, has appointed the **Bert Carpenter Co.,** 201 Krim Bldg., Birmingham, Mich., as its exclusive representative in Michigan and northern Ohio.

OBITUARIES

Edwin R. Motch

Edwin R. Motch, 72, chairman of the board of Motch & Merryweather Machinery Co., Cleveland, died suddenly June 7. Co-founder of the machinery firm in 1904, he was a well known figure in the machine tool trade, and served as president of the firm for many years. He was named chairman of the board last year and his son, Edwin R. Motch, Jr., was elected president.

Frank J. Vlchek, 76, founder and president of Vlchek Tool Co., Cleveland, died June 10. In 1895 he opened his own shop which expanded through the years specializing in the manufacture of hardware and various tools. Shortly before the recent conflict, the firm built a plastics plant in Ohio.

Albert G. Gruss, 57, superintendent of the mechanical division of the Doehler-Jarvis Corp., Toledo, Ohio, passed away May 19. He was one of the first employees of the Doehler firm and was a national authority on die casting.

W. King White, 45, succumbed June 16. A director of the Oliver Corp. at the time of his death, he had served as president of the Cleveland Tractor Co. from 1929 until 1944 when it was sold to Oliver.

W. Snowden Smith, 91, former secretary-treasurer of the Cincinnati Rolling Mills, Cincinnati, died June 8.

Louis W. Kempf, 49, passed away June 14. Mr. Kempf was assistant director of research at the aluminum research laboratories of the Aluminum Co. of America and invented several alloys and processes used in the manufacture of aluminum.

Charles V. Crellin, 77, founder and president of the Crellin Machine Works, Los Angeles, when he retired in 1942, died June 5.

John A. St. Clair, 64, passed away May 15. Mr. St. Clair had been with E. C. Atkins & Co., Indianapolis, since 1901 and recently served as industrial and mill saw sales engineer.

William Pigott, Jr., 53, president of the Seattle Steel Co. and the Seattle Brass Co., Seattle, died May 29.

Albert C. Wischmeyer, 61, president and treasurer of the Nunn Brass Works and treasurer of K. Barthelmes Mfg. Co., Inc., metal stamping firm, of Rochester, N. Y., died May 30.

Clarence M. LeCount, 61, consultant to General Electric's federal and marine section of the industrial department for the Pacific district, died May 29.

MEETINGS

American Society of Mechanical Engineers. Fall meeting. Hotel Utah, Salt Lake City, Utah. Sept. 1-4. Ernest Hartford, executive assistant secretary, 29 W. 39 St., New York.

Instrument Society of America. Annual conference and exhibit. Hotel Stevens, Chicago. Sept. 8-12. National office, 1117 Wolfendale St., Pittsburgh.

National Machine Tool Builders Association. Machine Tool Show. Dodge-Chicago plant, Chicago. Sept. 17-26. Tell Berna, general manager, 10525 Carnegie Ave., Cleveland.

thread checking time and costs Reduced!

Only two instruments are required in many plants to solve external thread checking problems—Sheffield's new Adjustable Leadchek and the Sheffield Visual Gage with thread checking accessories. Checking is quick, accurate and inexpensive.

Write for detailed information on these instruments—and for other thread gages not illustrated.

1 **NEW ADJUSTABLE LEADCHEK** for range of 4½ to 60 threads per inch and for work up to 2" in diameter, equipped with a "tenth" dial indicator for production use or with an "Electrigage" for the toolroom where tolerances are as close as .0001". Write for Inst. No. 27.

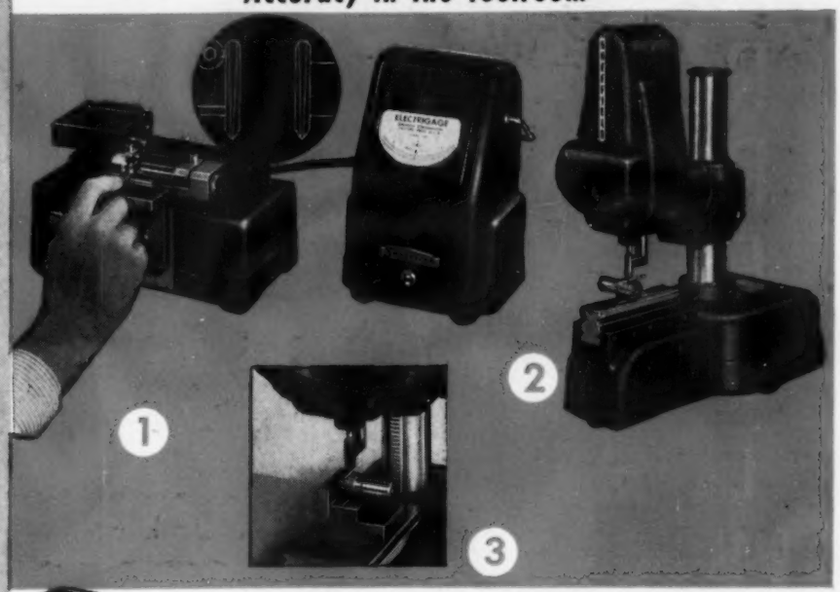
2 **VISUAL GAGE** with thread checking attachment for three wire checking of PITCH DIAMETER. Write for VG-500-45.

3 **SINE BLOCK** used with Visual Gage for checking MAJOR DIAMETER, PITCH DIAMETER and TAPER of tapered pipe threads up to 3" in diameter. Write for VG No. 4.

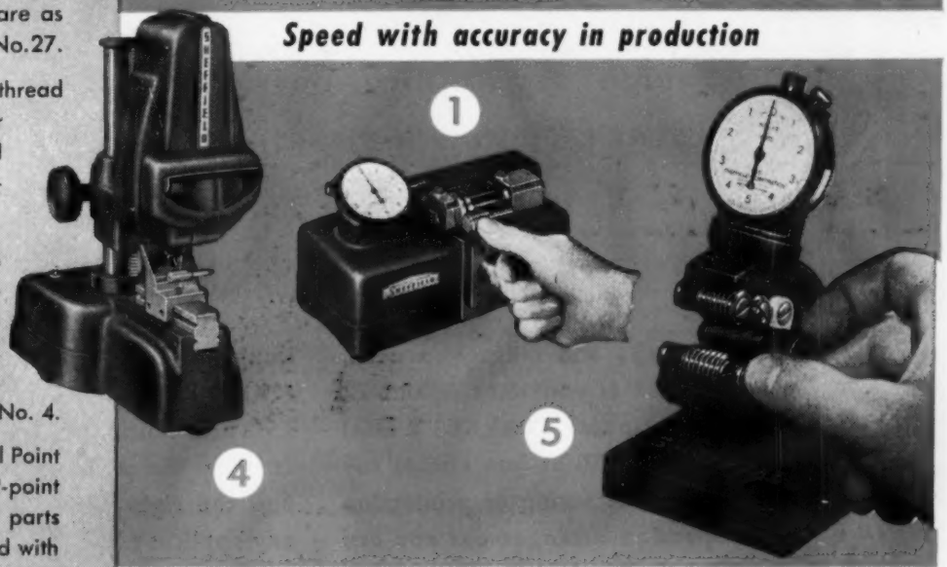
4 **VISUAL GAGE** with Ball Point Accessory for a rapid 2-point check of PITCH DIAMETER of parts up to 1" nominal diameter and with an accuracy comparable to the three wire method. Parts up to 2" can be handled with larger accessory. Write for VG No. 2.

5 **THREADCHEK** for the rapid inspection of LEAD, PITCH DIAMETER, THREAD ANGLE, ROUNDNESS, TAPER and STRAIGHTNESS, especially for studs, bolts and other threaded elements produced in large volume. Write for Inst. No. 10.

Accuracy in the toolroom



Speed with accuracy in production



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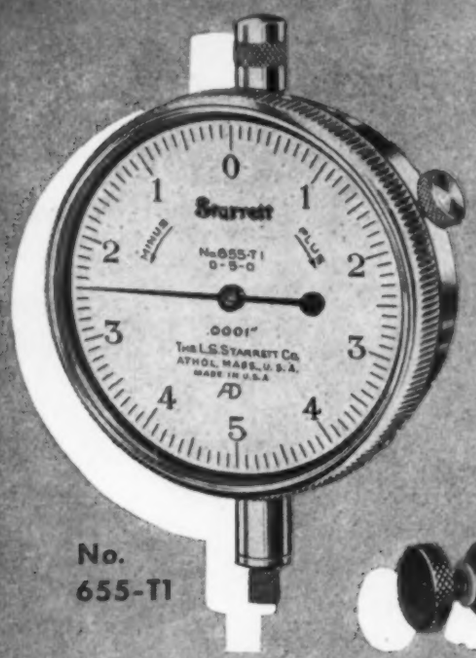
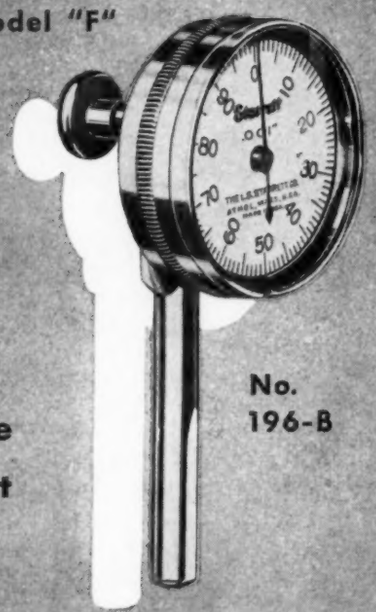


No. 655-T1

LAST WORD
No. 711-F
Model "F"



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Stainless Steel Welding Electrodes

TWENTY-FOUR classifications of electrodes are listed in "Tentative Specifications for Corrosion Resisting Chromium and Chromium-Nickel Steel Welding Electrodes." These classifications are grouped in six series covering stainless-steel types commonly identified as 19-9 (or 18-8), 25-20, 18-12 Mo (or 18-8 Mo), 19-9 Cb (or 18-8 Cb), 16 Cr and 4 to 6 Cr Mo. Persons interested in data other than the tabulated material, such as the general test requirements, may obtain a copy of the specifications from the sponsoring societies for 25¢ per copy. Designations of the tentative standard, according to sponsor, are : A5. 4-46T—the American Welding Society, 33 West 39th St., New York 18, and A298-46T—The American Society for Testing Materials, 1916 Race St., Philadelphia 3.

TENSILE REQUIREMENTS FOR ALL-WELD METAL.

Series	Tensile Strength, min., psi.	Elongation in 2 in., min., %	Heat Treatment
E308	80 000	35	none
E310	80 000	30	none
E316	80 000	30	none
E347	80 000	30	none
E430	70 000	20	[a]
E502	60 000	20	[b]

[a] Specimen shall be heated to between 1400 and 1450 F. and held for 4 hr., furnace cooled at a rate not exceeding 100 F. per hr. to 1100 F. and air cooled.

[b] Specimen shall be heated to between 1550 and 1600 F. and held for 2 hr., furnace cooled at a rate not exceeding 100 F. per hr. to 1100 F. and air cooled.

[a] ASTM Specifications Referred to in Selection Guide (right)

A167 . . . Corrosion-Resisting Chromium-Nickel Steel Plate, Sheet and Strip

A176 . . . Corrosion-Resisting Chromium Steel Plate, Sheet and Strip

A240 . . . Corrosion-Resisting Chromium and Chromium-Nickel Steel Plate, Sheet and Strip for Fusion-Welded Unfired Pressure Vessels

A263 . . . Corrosion-Resisting Chromium Steel Clad Plate, Sheet and Strip

A264 . . . Corrosion-Resisting Chromium-Nickel Clad Plate, Sheet and Strip

A158 . . . Seamless Alloy-Steel Pipe for High-Temperature Service

A268 . . . Seamless and Welded Ferritic Stainless Steel Tubing for General Service

A269 . . . Seamless and Welded Austenitic Stainless Steel Tubing for General Service

A270 . . . Seamless and Welded Austenitic Stainless Steel Tubing for the Dairy and Food Industry

A271 . . . Seamless Austenitic Chromium-Nickel Steel Still Tubes for Refinery Service

A276 . . . Hot-Rolled and Cold-Finished Corrosion Resisting Steel Bars

A198 . . . 20% Chromium, 9% Nickel Alloy-Steel Castings

A222 . . . Chromium-Nickel Alloy Steel Castings

USABILITY CHARACTERISTICS OF ELECTRODES

	Classification No.	Current[a]	Position of Welding[b]
E308 Series (19 chromium, 9 nickel)	E308-15	d.c.	F, V, OH, H
	E308-16	a.c. or d.c.	
	E308-25	d.c.	H-Fillets, F
	E308-26	a.c. or d.c.	
E310 Series (25 chromium, 20 nickel)	E310-15	d.c.	F, V, OH, H
	E310-16	a.c. or d.c.	
	E310-25	d.c.	H-Fillets, F
	E310-26	a.c. or d.c.	
E316 Series (18 chromium, 12 nickel with molybdenum)	E316-15	d.c.	F, V, OH, H
	E316-16	a.c. or d.c.	
	E316-25	d.c.	H-Fillets, F
	E316-26	a.c. or d.c.	
E347 Series (19 chromium, 9 nickel with columbium)	E347-15	d.c.	F, V, OH, H
	E347-16	a.c. or d.c.	
	E347-25	d.c.	H-Fillets, F
	E347-26	a.c. or d.c.	
E430 Series (16 chromium)	E430-15	d.c.	F, V, OH, H
	E430-16	a.c. or d.c.	
	E430-25	d.c.	H-Fillets, F
	E430-26	a.c. or d.c.	
E502 Series (4 to 6 chromium with molybdenum)	E502-15	d.c.	F, V, OH, H
	E502-16	a.c. or d.c.	
	E502-25	d.c.	H-Fillets, F
	E502-26	a.c. or d.c.	

[a] Where d.c. is specified, reversed polarity, (electrode positive) is required.

[b] The abbreviations F, H, V, OH, and H-Fillets indicate welding positions as follows:
F = Flat, H = Horizontal, V = Vertical (For electrodes $\frac{1}{4}$ in. and smaller), and OH = Overhead (For electrodes $\frac{1}{4}$ in. and smaller)
H-Fillets = Horizontal Fillets.

CHEMICAL REQUIREMENTS FOR ALL-WELD METAL.

Series	Carbon, max., %[a]	Chromium %	Nickel, %	Manganese, max., %	Silicon, max., %	Phosphorus, max., %	Sulfur max., %
E308	0.08	19.0 min.	9.0 min.	2.50	0.75	0.040	0.040
E310	0.20	25.0 min.	20.0 min.	2.50	0.75	0.040	0.040
E316[b]	0.08	17.0 min.	11.0 min.	2.50	6.75	0.040	0.040
E347[c]	0.08	18.0 min.	9.0 min.	2.50	0.80	0.040	0.040
E430	0.10	15.0 min.	0.60 max.	0.75	0.75	0.040	0.040
E502[d]	0.10	4.0 to 6.0	0.40 max.	0.75	0.75	0.040	0.040

[a] Carbon shall be analyzed to the nearest 0.01%.

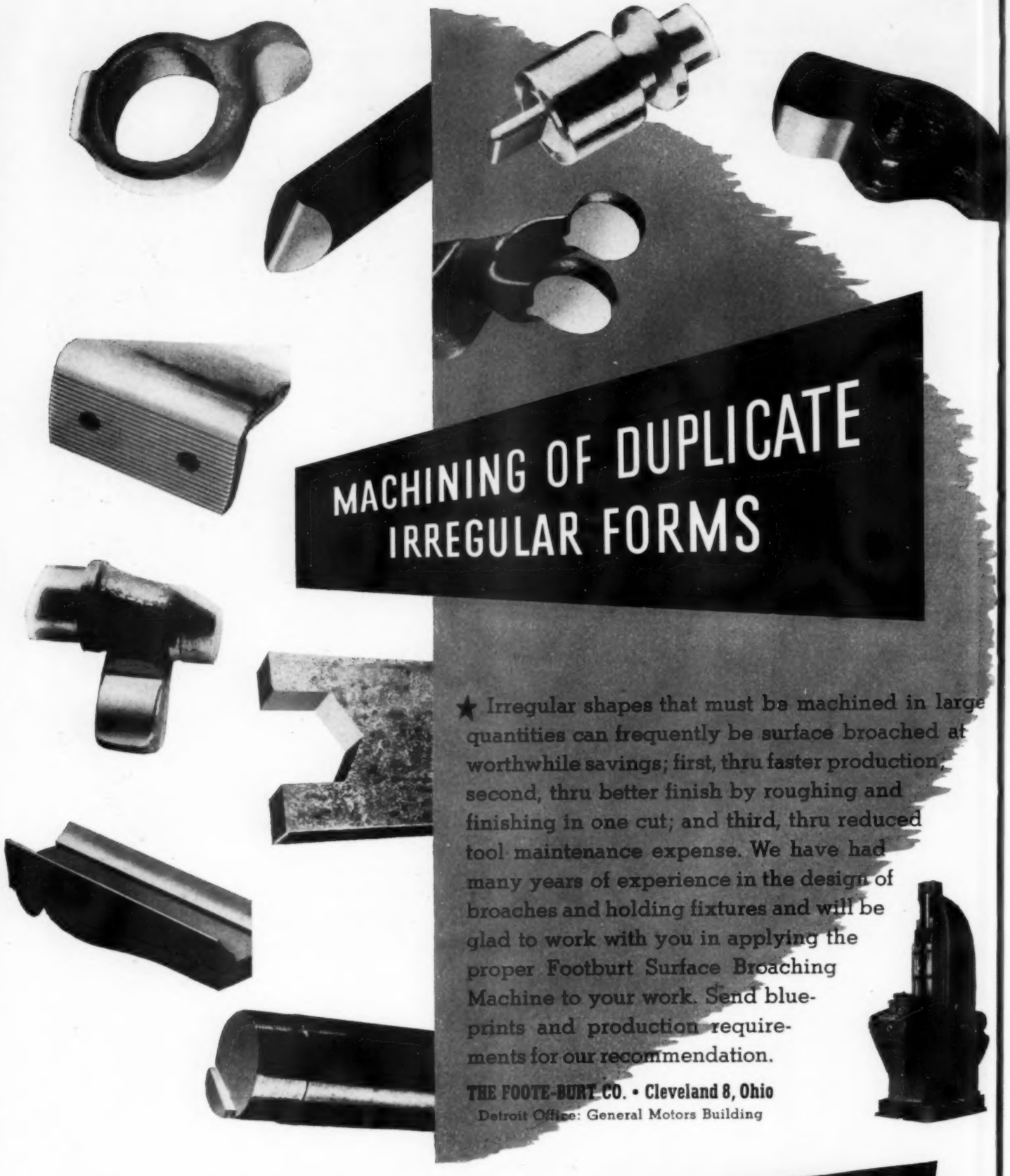
[b] Series E316 shall have a molybdenum content between 1.75 and 2.50%.

[c] Series E347 shall have a columbium content of not less than ten times the carbon content and not more than 1.00%.

[d] Series E502 shall have a molybdenum content between 0.45 and 0.65%.

GUIDE TO THE SELECTION OF ELECTRODES FOR WELDING MATERIALS COVERED BY A.S.T.M. SPECIFICATIONS.

Type of Material, A.S.T.M. Designation[a]	Electrode Series					
	E308	E310	E316	E347	E430	E502
Plate, Sheet and Strip:						
A167	Grades 3 and 4	Grade 10	Grade 11	Grade 6	Grade 4	
A176						
A240	Grade S		Grade M	Grade C		
Clad Plate, Sheet and Strip:						
A263					Grade B	
A264	Grades 3 and 4	Grade 10	Grade 11	Grade 6		
Pipe and Tubing:						
A158	PSa			PSd	No. TP 430	P5
A268						
A269	No. TP 304		No. TP 316	No. TP 347		
A270	No. TP 304					
A271	No. TP 304			No. TP 347		
Hot-Rolled and Cold-Finished Bars						
A276	No. 304		No. 316	No. 347	No. 430	
Castings						
A198	Grade A					
A222		Class B				



MACHINING OF DUPLICATE IRREGULAR FORMS

★ Irregular shapes that must be machined in large quantities can frequently be surface broached at worthwhile savings; first, thru faster production; second, thru better finish by roughing and finishing in one cut; and third, thru reduced tool maintenance expense. We have had many years of experience in the design of broaches and holding fixtures and will be glad to work with you in applying the proper Footburt Surface Broaching Machine to your work. Send blueprints and production requirements for our recommendation.

THE FOOTE-BURT CO. • Cleveland 8, Ohio
Detroit Office: General Motors Building

FOOTBURT *Surface Broaching*

FOOTBURT PATENTED TOOTH FORM

Finishing of Zinc-Base Die-Castings—I

From a paper presented before the American Electroplaters' Society by C. F. Nixon, director of process engineering, Fisher Body - Ternstedt Division, Detroit.

QUALITY and finishing of zinc-base die-castings are important, because 75% of tonnage is used in automotive applications, and of this quantity 75% is chromium plated.

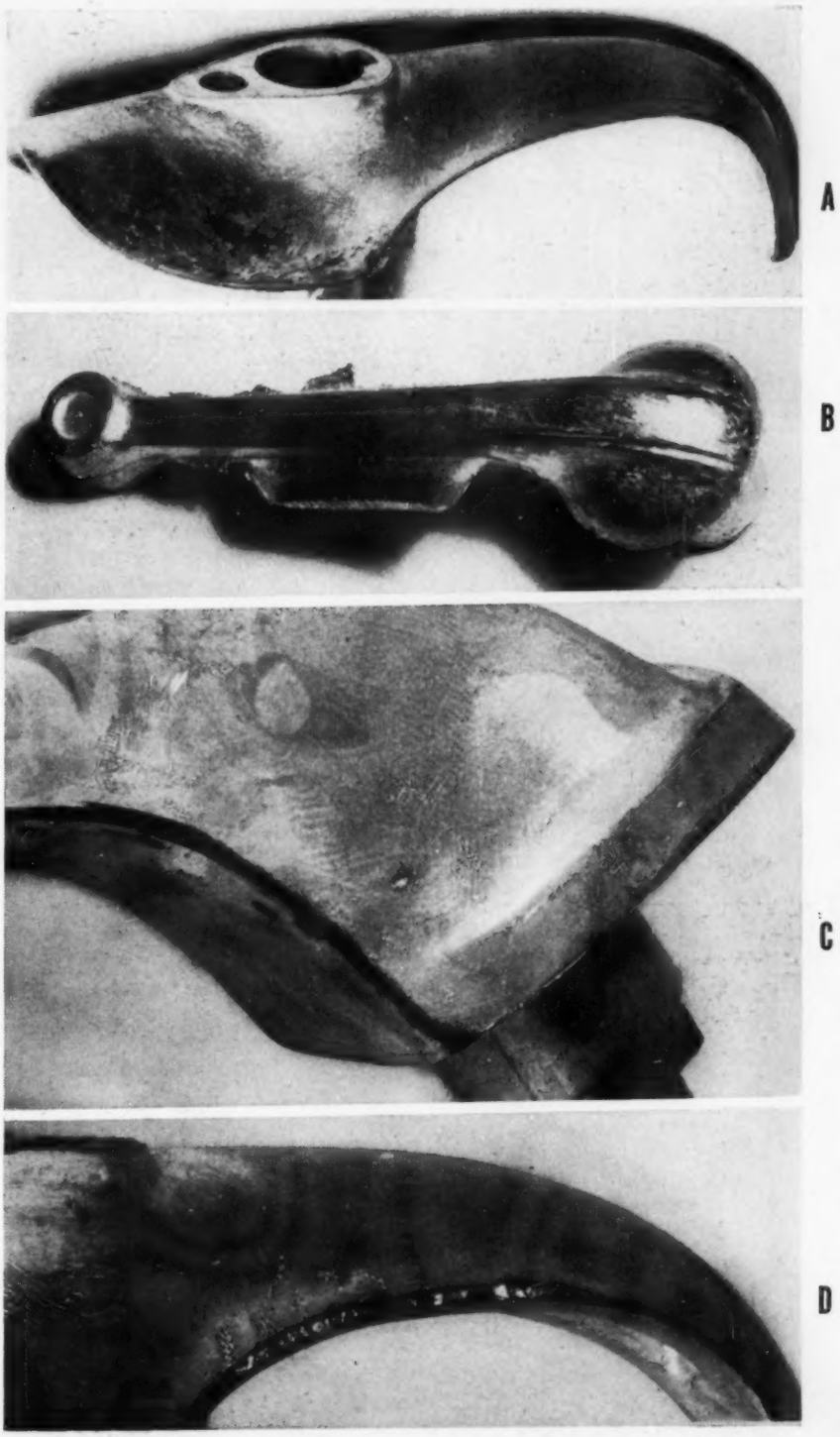
Introduction of a copper plate as first deposit on zinc-base die-castings made it possible: (1) to plate articles of complicated shape, and (2) to develop plate thicknesses sufficient to insure reasonably good performance out of doors. Thus, the use of copper strike has come into general use for all parts, including interior hardware, even though nickel deposits heavier than 0.0002 in. are not required.

Specifications for total plate thickness are: Class *A*—0.001 in. to give satisfactory performance out of doors for one year in industrial atmospheres; Class *AA*—0.0015 in., and Class *AAA*—0.002 in., the trend being toward the heavier deposits.

Polishing and Buffing

Before plating, the part must be polished to remove irregularities at the trim line and to remove surface imperfections. Aside from polishing to repair damage done by trimming, a good die-casting requires no polishing. A buffing operation only should be required to prepare it for plating. While gating of a die is still considered an art, the finisher may in fairness demand castings with smooth, sound surfaces. Die-castings have a thin, dense outer skin, below which the metal is coarser grained and more porous. When polishing is carried out to remove surface defects, this skin is cut through, producing faults as troublesome as those for which polishing was used as a corrective measure.

Polishing is done by means of a sheepskin wheel coated with glue and emery, usually 180 or 220 grit, or by means of an emery belt which may be driven by either a hard wheel or by a cloth buff wheel if a more flexible polishing surface is



DEFECTS IN DIE-CAST SURFACES: A—*shills;* B—*swirls;* C—*splashes, and* D—*gate holes. Such defects must be removed by expensive polishing, which may cut through the skin, and are to be avoided through closer control of the die-casting process and mold design*

Recessed head screws of all kinds are among the many difficult jobs that ARMCO Cold-Heading Wire takes in stride.

The Rustless Division of Armco, world's largest producer of stainless steel wire for cold heading, makes this special rustless steel wire for cold upsetting and forging. The work hardening rate is low, which facilitates slotting and increases die life.

When you use ARMCO Cold-Heading Wire you can expect to get coil after coil right in line with your specifications, both in temper and size. It comes to your plant with a uniform coating that assures a smooth, easy flow in the dies from start to finish.

Quick Delivery

Besides a trim, clean-cut appearance, ARMCO Cold-Heading Wire gives your products all the other advantages of stainless steel — great strength and exceptional resistance to corrosion, staining and high heat.

You can get quick delivery of ARMCO Cold-Heading Wire by writing or 'phoning The Rustless Iron & Steel Division, The American Rolling Mill Co., 3426 E. Chase St., Baltimore, Md.

THE RUSTLESS IRON & STEEL DIVISION

The American Rolling Mill Company

Rustless

DIVISION OF ARMCO

Finishing of Zinc-Base Die-Castings—II

desired. Grease is applied to the wheel to prevent loading or glazing and to reduce friction, to increase the life of the abrading surface, and to improve the quality of the ground surface.

Buffing is done on cloth wheels 10 to 14 in. in diameter sewed as the nature of the particular job demands —which is usually determined by experiment or experience with previous similar jobs. A tripoli compound is used. Wherever possible, automatic equipment is used in preference to hand polishing or buffing.

Cleaning

The cleaning of die-castings before plating is a difficult operation. Buffed die-castings, especially those automatically buffed, are sometimes very dirty. Soil must be removed with minimum chemical action on the die-casting, even if compound is trapped in recesses. Over-long exposure of the work in an alkaline cleaning solution is prone to cause blistering of a copper deposit.

First step in removing soil is best done with trichlorethylene degreasing, and if placed on plating racks, handling is minimized. This step will remove the binder but perhaps not all of the solids in the polishing compound. Hand brushing is indicated in this case.

Alkaline cleaning is done in a solution containing 2 or 3 oz. of a cleaner made up of 55% soda ash, 25% trisodium phosphate and 20% sodium hydroxide, operated at 200 F. The work is the anode and the voltage from anode to cathode is 6 volts. Reverse cleaning is preferred because contamination with chromium, zinc and copper salts is less.

After alkaline cleaning the work is rinsed in cold water and immersed in a 1½% sulphuric-acid dip for 20 to 30 sec., rinsed and is then ready for the copper cyanide deposit.

There is an important relationship between the strength of the acid dip and the strength of the alkaline cleaning. If it is necessary to use a stronger cleaner or to clean for a longer period of time, then it seems to be necessary to increase the strength and the time of acid dipping. However, in general, it seems safe to say that both the cleaner and the acid should be as weak and as of short a duration as possible. For a particular set of circumstances, it will be necessary to establish concentrations and times by experiment. When the sequence of cleaning and acid dipping given above is used, the die-casting is but slightly more gray in appearance as it comes from the acid dip than it was when it went into the cleaner.

The balance of the cleaning and plating cycle may be carried out using still tanks, or, given sufficient volume of production, automatic plating equipment may be used. In either case, the sequence of operations is essentially the same, although in some cases it may be necessary to modify conditions in various tanks to accommodate the process to the time cycle of an existing plating machine.

The copper strike solution (see table) is maintained at 110 to 115 F. Some steel anodes are used along with the copper anodes to prevent build-up of copper concentration. It is important that the copper content be kept within prescribed limits for a bright, smooth deposit. Sodium carbonate content should be kept less than 15 oz. per gal., and will not build up to excessive limits under the operating conditions cited. Current density between 20 and 30 amp. per sq. ft. is employed, and the time in the cyanide bath may run from 5 to 10 min. It is not desirable to copper plate a thickness greater than 0.0002 in. if bright deposits are to be used over it without buffing.

Copper Strike Solution

	Analysis Oz. per gal	Make up Lb. per 1000 gal
Copper cyanide	2.5	160
Sodium cyanide	...	190
Free cyanide	1.0	...
Sod. hydroxide	1.0	65
Rochelle salts	6.0	375
Sod. carbonate	2.0	125

After the copper strike operation, the desired thickness of copper or nickel, or both, may be built up as for any base metal. To reduce costs, there is an increasing tendency to use bright copper deposits and bright nickel deposits, followed by chromium plate, and without buffing operations on either the copper or the nickel. This procedure eliminates the hazard of cut-throughs as the result of buffing and holds down costs.

When parts are carried from one plating operation to another without intermediate buffing, the items are ordinarily not unracked until after chromium plating. Under these conditions it is not always possible to prevent contamination of cleaning solutions with chromium. Therefore it is desirable, before racks are used again, to strip them anodically in a sodium-carbonate solution.

Stripping

There is no altogether satisfactory method for stripping heavy deposits of copper and nickel from die-castings. The best method is the sulphuric-acid strip, using a concentration of 50 to 55%. Stripping action is reasonably rapid while attack on the die-casting is ordinarily not excessive. The temperature is 150 F., the voltage, 9 volts. If the concentration of acid is increased, the rate of attack on the copper becomes quite slow. Under these conditions, when base metal is reached at certain portions of the piece, attack on the die-casting may be severe before the balance of the copper has been removed.

Additions of glycerine have been tried but are not recommended. There is no appreciable improvement in the quality of the stripping, but there is an increase in hazard because glycerine causes foaming. The foam bubbles contain both hydrogen and oxygen, which may be exploded by a spark, to splash acid. Other agents have been tried without success in improving performance of straight sulphuric acid.

Announcing

A NEW LINE OF PRECISION CONTOUR TURNING AND BORING MACHINES

Accurate and Fast — Cam and Air Actuated

Featuring **1.** An endless variety of contours or combinations may be generated with a single-point tool. Besides all the regular jobs of straight precision boring and turning, facing and chamfering, it will produce lands, recesses, flanges, steps, counterbores, and radii.

2. A disc type cam for each table gives positive action consistently throughout the day — from the first to the last piece — uninfluenced by temperature changes.

3. Through positive cam action, tool approaches on rapid traverse to within .005 of the work and immediately starts to feed. Tool may cut on feed-in or drawback stroke, or both for rough and finish cuts. On return stroke, tool jumps clear eliminating drag off marks. When moving between intermittent or successive cuts, tool goes into rapid traverse.

4. Uniform temperature, anti-friction bearings, and super-precision spindles provide spindle speeds up to 7,500 RPM. Mechanical precision chucking operated by air cylinders. Neither chucking nor unchucking operation affects preload or position of spindle bearings.

5. Only one dimension need be inspected on any one set-up, regardless of the number of diameters produced by any one single-point tool. Cams control and positively repeat from piece to piece.

6. Set-up of machine depends entirely upon nature of job. Work may be rotated in spindles or mounted on table, loaded from the front of the spindle or through the spindle. Spindles may be raised, lowered, or separated. Two spindles are standard, but more may be added. Changing job set-up simply requires replacing two cams, setting tool for size and changing chucks.

THE NEW BRITAIN MACHINE CO. NB

IN THE MIDST OF EVERYTHING AT THE SHOW

You may see this machine in operation in our Booth No. 311 at the Show. We will also have a complete line of six spindle automatic screw machines, four, six and eight spindle chucking machines, a double end chucker, and a new revolutionary turret lathe. We'll be seeing you September 17.

M-01060

NEW BRITAIN

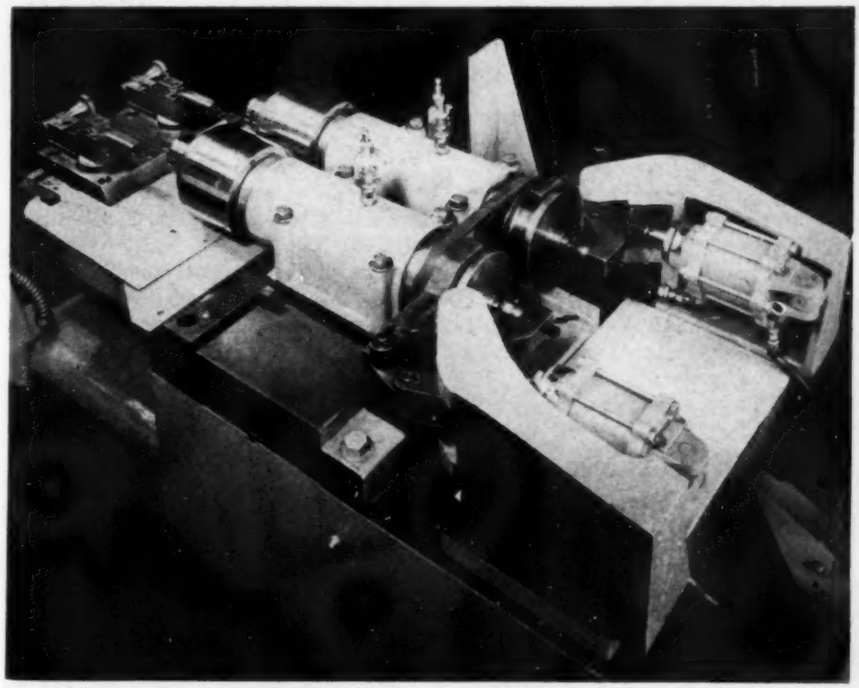
Automatics

THE NEW BRITAIN MACHINE COMPANY
NEW BRITAIN-GRIDLEY MACHINE DIVISION
NEW BRITAIN, CONNECTICUT

Shop Equipment News

NEW BRITAIN MACHINE CONTROLS CONTOUR WORK BY DISK CAMS

Two heads are ordinarily supplied on the New Britain boring and turning machine. Additional spindles can be mounted to suit special requirements.



Air cylinders and chuck-releasing toggle mechanism actuate the chucks. Pedal-operated cylinders apply power to spindle and pushrod simultaneously to avoid unbalanced pressure on spindle bearings

A single-point tool, directed by the compound action between a longitudinal table and lateral slide, produces straight or contour work on the line of precision contour boring and turning machines introduced by The New Britain Machine Co., New Britain-Gridley Machine Div., New Britain, Conn. Two disk-type cams opposed by air cylinders actuate the table and slide for cutting lands, recesses, flanges, steps, counterbores, and radii on steel, non-ferrous metals, or plastics.

Cams move the tool to within 0.005 in. of the work on rapid traverse, then feed into the cut. The tool will jump across successive portions of the work not requiring machining. Work can be done on the feed-in stroke with the tool jumped clear on the return stroke to prevent drag-off marks, or the tool can move to the bottom of the work on rapid traverse and cut on the drawback stroke.

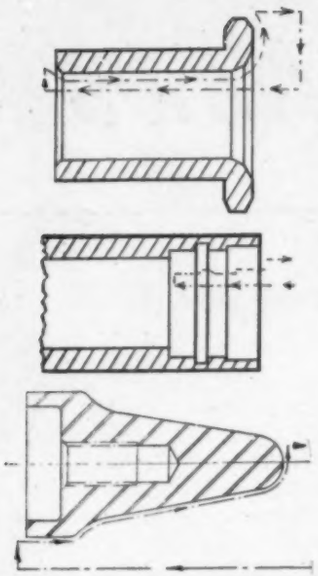
Temperature changes are said not to affect the accuracy of the machine. The manufacturer says that experience has proven that only one dimension of the work performed by any single tool need be inspected, for the cams cause positive repetition from piece to piece.

Mechanical chucks are actuated by a toggle mechanism and air cylinders. Neither chucking nor unchucking affects preload or position of spindle bearings. Spindle speeds up to 7500 rpm. are possible.

To change the setup the two disk cams are replaced, the tool is repositioned, and the chucks are adjusted. A micrometer arrangement on the toolholder is provided for any final slight tool adjustment.

Spindles may be raised or lowered, separated or moved closer together. Work may be mounted on the table with a tool and boring bar in the spindle, or held in chucks with a tool or tool cluster on the table. In such cases the work can be loaded in the chucks or fed through spindles.

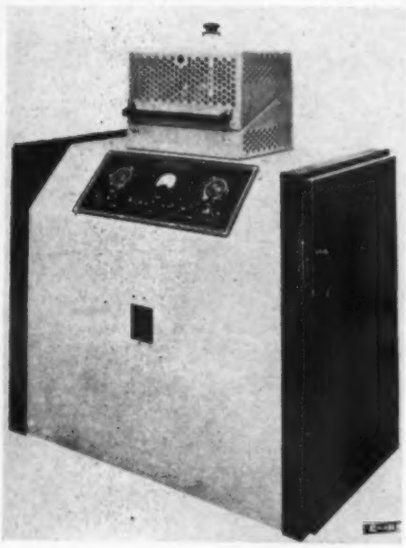
On jobs where a facing or forming



Path of tool travel is indicated by dotted lines in these typical operations

operation is time consuming, a separate cross-slide can be mounted and separately actuated to cut simultaneously with the boring tool. Machines are also available without the contour slide and in other adaptations.

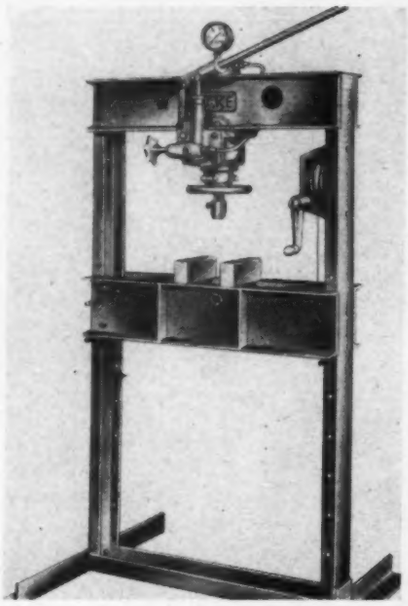
Westinghouse 40.9-Mc Dual Timer For Heating Plastic Preforms



A 2-kw. dielectric heating generator, the 40.9-Mc Dual Timer, has been announced by Westinghouse Electric Corp., P. O. Box 868, Pittsburgh 30, Pa. Part of a line of nineteen 2- to 200-kw. output R.F. generators, the unit is used to heat plastic preforms. It has a special cubicle providing two sets of operating controls to permit operations of the generator on two different time cycles. Thus a single generator can supply heated preforms alternately to two presses operating on different loads.

Two adjustable automatic timing relays are built into the control panel. They provide alternate power-on periods from 0 to 165 sec. each. Separate start-and-stop pushbuttons and "load-on" lights are provided.

Dake 25-Ton Hydraulic Press Incorporates Extra-Large Pump



The Model 25H hydraulic press has been announced by Dake Engine Co., Grand Haven, Mich. Of 25-ton capacity, it is designed as an intermediate-size press for the Dake line.

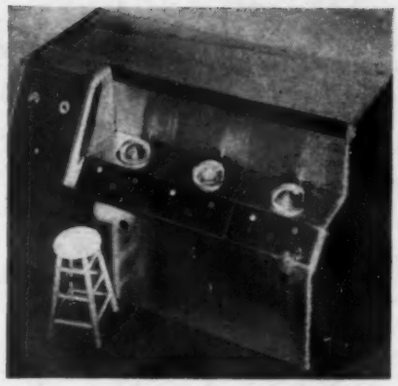
An extra-large pump is incorporated to provide fast ram travel. The screw-type ram provided can be advanced quickly by hand to speed operation. The press is constructed of reinforced arc-welded steel channel. Work up to 33½-in. dia. can be handled between uprights.

Standard equipment includes round nose for pressing, two combination table and V-blocks, table-hoisting mechanism and pressure gage. The press can be furnished without hoist and gage.

Eitel-McCullough Vacuum Furnace Heat-Treats Reactive Materials

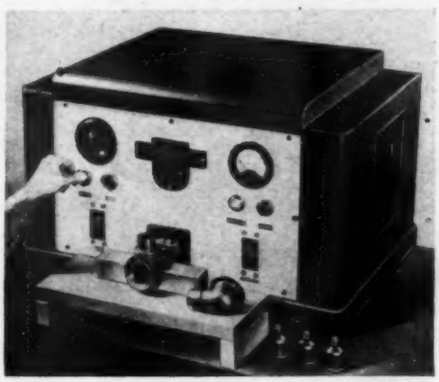
Materials highly reactive toward gasses are heat-treated in a high-vacuum furnace developed by Eitel-McCullough, Inc., 1570 San Mateo Ave., San Bruno, Calif., The standard type consists of three chambers integrated into a single cubicle.

The furnace is heated by low-voltage, large-diameter tungsten elements. The design is said to cut



down on ionization and permit rapid temperature rise. Cycling circuits are incorporated so that one chamber can be in treatment, one under preliminary pumping, and the third being reloaded. Capable of continuous operation at temperatures around 1800 C., the furnace is said to attain a production vacuum as high as 5×10^{-6} mm. of mercury. Program timers control the cycle.

Ther-Monic Model 43 Generator For Induction-Heating Work



The Ther-Monic Model 43 induction-heating generator is made by Induction Heating Corp., 389 Lafayette St., New York 3, N. Y. A 750-w. bench-type unit, it operates on 120-v. 60-cycle single-phase power supply. Full-load output is 43 Btu. per min.

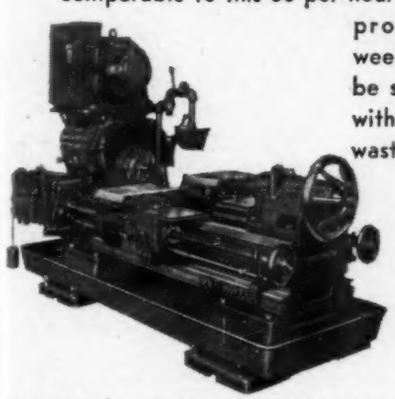
The Model 43 combines power section and work applicator in one unit. It can be used to speed up hardening, brazing, melting and other operations. It can be used with conveyor belts, turntables, rotary spindles for automatic feed or fixtures for manual feed.

The tube complement consists of one standard heavy-duty air-cooled oscillator and two standard rectifier tubes. Controls provide for automatic or manual operation. Single or multi-turn coils can be made by shaping copper tubing or wire to the work.

Double Action WITH DUOMATICS SPEEDS PRODUCTION

NOTED MANUFACTURER REPORTS*

From rough workpiece to perfectly finished part, Lodge & Shipley Duomatics produce . . . automatically, smoothly and accurately . . . turn out clutch couplings in little more time than it takes to tell. Even with unskilled operators, Lodge & Shipley Duomatics (full automatic lathes) easily reach production rates comparable to this 60-per hour example . . . maintain production for days or weeks on end . . . or can be switched to other jobs without complicated, time-wasting cam changes.



A big reason for such unusual output is Duomatic Double Action . . . the Duomatic is like two lathes in one . . . dual tool slides, front and rear, operate singly or together, without attention from operator.

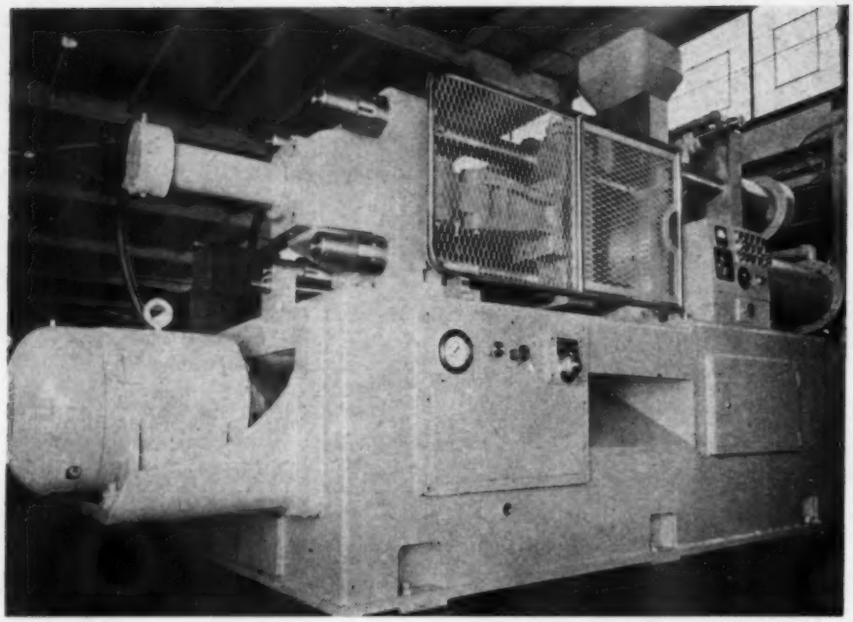
No matter how complex the job . . . how many combinations of straight or angular "in and out" turning and facing operations, the Duomatic can show big profits in time saved. Have a Lodge & Shipley Engineer demonstrate on your own parts. Write for Bulletins 635 (2-A Duomatic for smaller parts) and 634 (3-A Duomatic for larger parts).

*Name on request

THE **Lodge & Shipley** COMPANY

CINCINNATI 25, OHIO

MACHINE TOOL DIVISION • 3055 COLERAIN • SPECIAL PRODUCTS DIVISION • 800 EVANS ST.



Outstanding feature of the Hy-Jector is a dielectric heating unit integral with the machine which automatically heats preforms during the cycle

Rockford Hy-Jector Molding Machine Preforms, Preheats, Molds Plastics

Thermosetting materials are preformed, preheated and molded in one fast operation in the Rockford Hy-Jector, recently announced by Rockford Machine Tool Co., Rockford, Ill. All movements of the unit are hydraulically powered, electrically controlled and automatically timed throughout the cycle.

A complete cycle can be set on the control panel and requires no further attention. Movements can also be pushbutton controlled for manual operation. Automatic operation is said to reduce rejects by eliminating the human element and to speed production by as much as 400% over former methods.

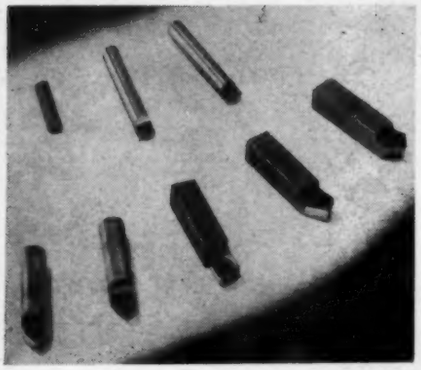
Material feeds by gravity from a hopper into a measuring chamber. The chamber is infinitely adjustable up to 8 oz. maximum and provides automatic selection of amount of material. The material is then carried to the throat of a preform cylinder. A plunger moves forward after the material is received into the cylinder, and the material is compressed into a preform. An adjustable pressure control provides correct preform density. Correct pressure is automatic for any size preform.

The preform is then carried automatically into the dielectric heating chamber, where it is heated to required temperature for a period of time as set on the controls. After the heating period, the preform is moved into the molding cylinder. The dies are in closed position and held by a maximum clamp pressure of 500 ton. As soon as the preheated preform is delivered to the molding cylinder, the ram rapidly advances and forces the preform into the die. Maximum molding pressure is 19,300 psi. Dies automatically open after the polymerizing period, ejecting the part. By forcing material directly into the mold, die pressure can be lowered, thus increasing die life.

The only function of the operator is to remove the finished part and any flash and to close the safety gate. The gate contacts a limit switch and another cycle is started.

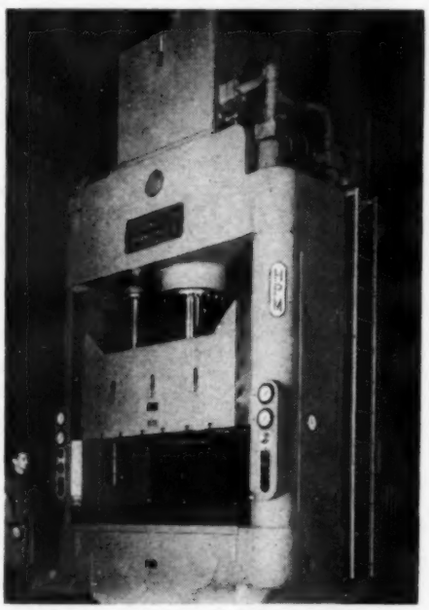
Five Carboloy Boring Tools Added to Standardized Line

Five styles of standardized carbide-tipped boring tools have been added to the line of Carboloy Co., Inc., Box 237, Roosevelt Park Annex, Detroit 32, Mich., making a total of seven styles. Styles 3 and 4 are round-shank tools for 30 and 45° boring bars and are made in four sizes each. Styles 5, 6 and 7 are square-shank tools for 30, 45 and 90° boring bars and are made in six sizes each.



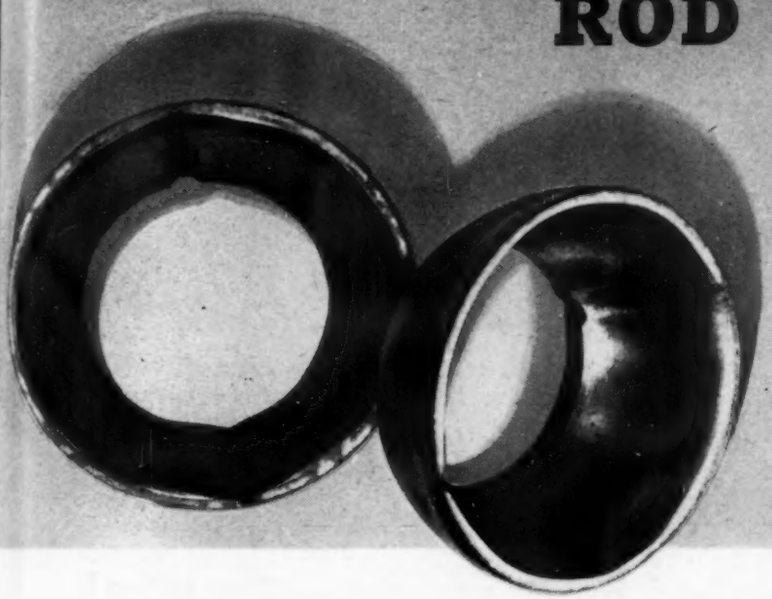
All the new tools have 7° primary clearance and 10° secondary clearance. All are finish ground with a nose radius. Styles 3 and 4 range from 5/16- to ½-in. dia. and have two grades of tips: for boring steel (grade 831) or for boring cast iron and non-ferrous and non-metallic materials (grade 833). Styles 5, 6 and 7 have shank sizes from 5/16 to ¾ in. Sizes to ½ in. have 883 and 831 tips, while the two larger sizes have 883 and No. 78 (for finishing and light-roughing cuts in steel).

Styles 1 and 2, which are square-end round-shank tools, are illustrated in background with a round blank for solid Carboloy boring tools.



DRAWING PRESS—500-ton Fastraverse sheet-metal press for deep drawing oblong shapes. Platen is 96x48 in., bed is 96x54 in. Press has 42-in. stroke with 48-in. maximum opening. Three independent die cushions have 27x32-in. platens, 18-in. stroke. Machine can be used for general-purpose, single-action work with die cushions inoperative. The Hydraulic Press Mfg. Co., Mt. Gilead, Ohio

5 MILLION ROD BEARINGS



formed with CARBOLOY Sheet Metal Blanking and Forming Dies

. . . WITHOUT REFINISHING

. . . AND STILL GOING STRONG

Saved cost of 7 Steel Cut-Out Dies, plus 44 maintenance hours, reports Thompson Products Company, Detroit

. . . and still practically as good as new", added Thompson Products Company. After forming 5,000,000 rod bearings with Carboloy Sheet Metal Dies, the record showed that to produce the same number of pieces, 7 steel cut-out dies would have been necessary. This saving also eliminated 44 hours in die maintenance time, resulting in 315,000 *additional* pieces produced.

Now consider these other Carboloy Cemented Carbide benefits: Closer tolerance on drawn parts —fewer" rejects"—lower cost per piece—virtually mirror-smooth finish, often with reductions in buffing time—and sizeable increases in output-per-press. You get more money, more production and less costs with CARBOLOY Sheet Metal Dies.

Carboloy Company Inc., 11149 E. Eight Mile Road, Detroit 32, Michigan.

START THE BALL ROLLING TODAY—WRITE FOR BOOKLET D-120

CARBOLOY® CEMENTED CARBIDE

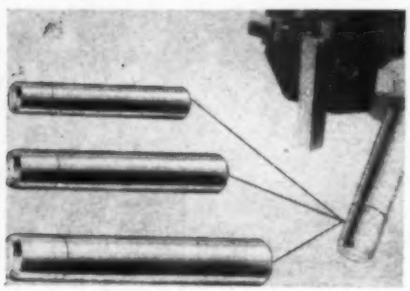
SHEET METAL DRAWING AND BLANKING DIES

Sellew "K" Adjustable Drillhead Has Two Spindles, Spiral Gears

The "K" type adjustable drillhead has been announced by Sellew Machine Tool Co., Pawtucket, R. I. A two-spindle, totally enclosed, full ball-bearing unit, it has spiral gears to produce smooth operation.

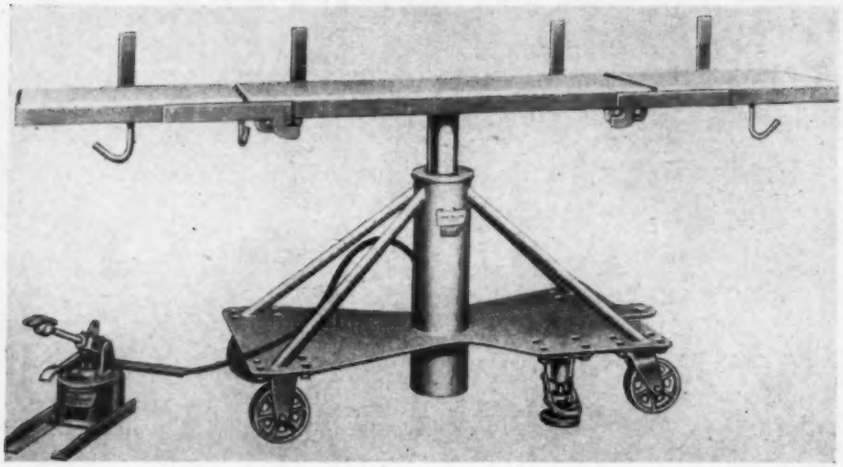
Drill capacity is 0 to ¼-in. Minimum adjustment between spindles is 1⅜ in. when using ¼-in. capacity Jacobs chucks, and maximum adjustment is 3¾ in. The unit can be used on any standard high-speed bench-model drilling machine or on standard floor-type machines with No. 2 Morse taper driving shank.

Boyar-Schultz Revolving Stop Mounted on Screw Machines



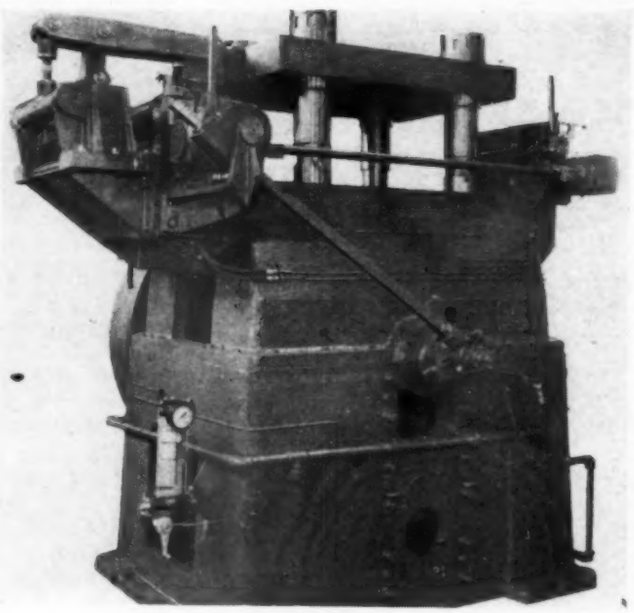
A revolving stop for screw machines is made by Boyar-Schultz Corp., 2110 Walnut St., Chicago 12, Ill. The unit has a free-turning, ball-bearing head designed to reduce friction between work and stop and to prevent marring of piece parts. An enclosed ball race prevents the entrance of chips and other matter.

The stop is made in three sizes and seven lengths. It is hardened for long life. Soft semi-finished heads are available for specially formed parts.



ELEVATING TABLE—Portable hydraulic unit is loaded with strips or sheets by overhead hoists or fork trucks. Elevating feature permits machine operator to keep stock at desired height for feeding into dies or shears. Made by Lyon-Raymond Corp., 3369 Madison St., Greene, N. Y.

Brandes Line of Automatic Presses Designed for Progressive-Die Work



A double-roll feed and scrap cutter are built onto this 175-ton Brandes press

A line of automatic presses available in sizes from 30- to 750-ton capacity is announced by Brandes Press Co., 6408 Euclid Ave., Cleveland, Ohio. Designed for progressive-die work, the units have large bed areas. They feature high-speed operation for blanking, forming and drawing work.

The crankshaft, which is located below the bed, works through a lower crosshead and guided draw rods to pull the top platen down evenly on the material at four points. Long multiple V-ways are included in the base to guide the lower crossheads. All reciprocating parts are air counter-balanced. The press has electrically controlled air-operated friction-disk clutch and brake.

No special foundations are required, because there are no structural members or operating parts below the base. Back-geared machines are also available in all sizes for deep drawing work. They have a special quick-feeding arrangement to permit a greater portion of the stroke to be utilized for drawing.

WORDS FROM PROMINENT STEELWELD PRESS USERS

FREEDOM FROM JAMMING RAM AND BREAKAGE OUTSTANDING FEATURE

"We can say that freedom from jamming down the ram and consequent breakage is one of the outstanding features of the Steelweld Brake."

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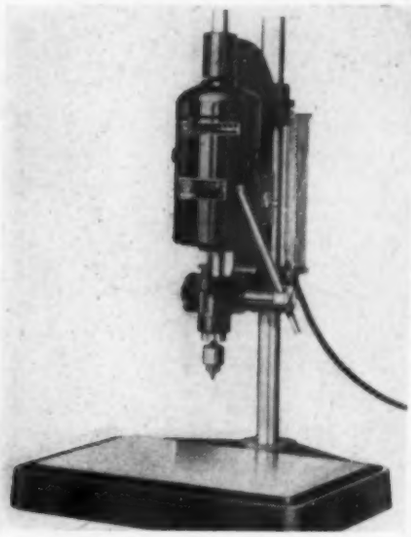
THE CLEVELAND CRANE & ENGINEERING CO.

1409 EAST 281st STREET WICKLIFFE, OHIO

STEELWELD PIVOTED BLADE SHEARS

Electro-Mechano Drillpress Uses Selective Quill Feed



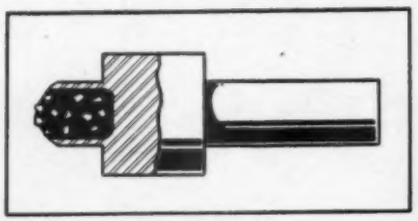
The Speed-Right drillpress for production drilling of small holes has been developed by The Electro-Mechano Co., 261 E. Erie St., Milwaukee 2, Wis. With drill capacity from 0.004 to 5/32-in. dia., different models are available with either ⅛- or 1/10-hp. motors and will operate on either ac. or dc. at 110 or 220 v.

Speed range is 1000 to 10,000 rpm. or 2500 to 15,000 rpm. Speed is continuously variable and is adjusted by fingertip control lever. Adjusted speed is maintained by a centrifugal-force electrical governor.

Motor, speed-control unit and chuck are mounted on a single spindle to minimize vibration at higher speeds. Selective quill feed provides normal direct-drive feed for drills larger than No. 60 and "Micro-feed" through backgears for drills down to 0.004-in. dia. Sensitivity is enhanced by an adjustable counter-balance mechanism and by the greater movement of the feed lever required for a given stroke when "Micro-feed" is used.

Cluster-Diamond Dressing Nib Avoids Dulling Wheel Grains

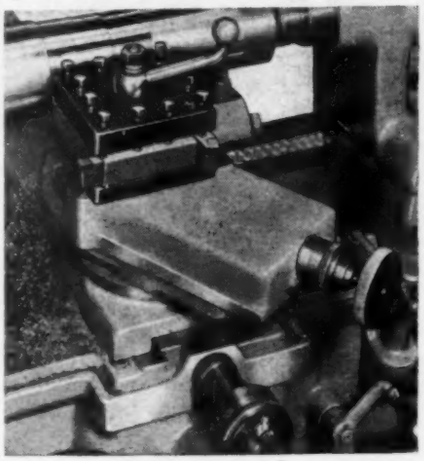
By using a special sintered alloy bond, The National Diamond Hone & Wheel Co. 108 Fulton St., New York 7, N. Y., has been able to produce a cluster-wheel dressing nib that is claimed not to dull the abrasive grains of the grinding wheel by abrasion with a hard bond. In addition, because many small diamonds are interspersed throughout the binder, the cost is said to be



about one-third as much as for a single-diamond nib of equivalent karat weight. The nib is offered for use in all high-production wheel dressing, such as required in centerless, cylindrical and other forms of external grinding, but not thread grinding.

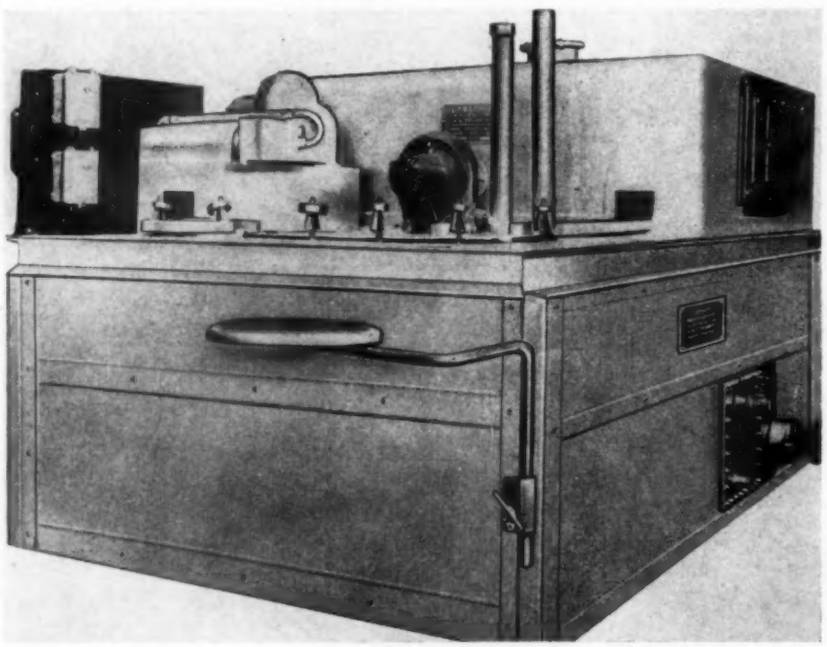
The softer sintered alloy bond is made of copper, nickel and cobalt metal powders mixed with titanium hydride. The copper content is high to carry heat away from the diamonds quickly. To obtain a tightly adherent bond, the diamonds are wetted with carbon tetrachloride and milled with the metal powders. This intimate mixture is then compressed into a tablet and sintered in the Strauss hot press. Finally, the sintered nib is sweated into the holder. Nibs can be supplied with cluster diamonds of proper size for dressing roughing wheels and in sizes for dressing finishing wheels. In either case, the dressing action is said to leave sharp grains, thus allowing longer periods between redressings.

Enco 12-Station Toolpost Turret Supports Carbide-Tipped Tools

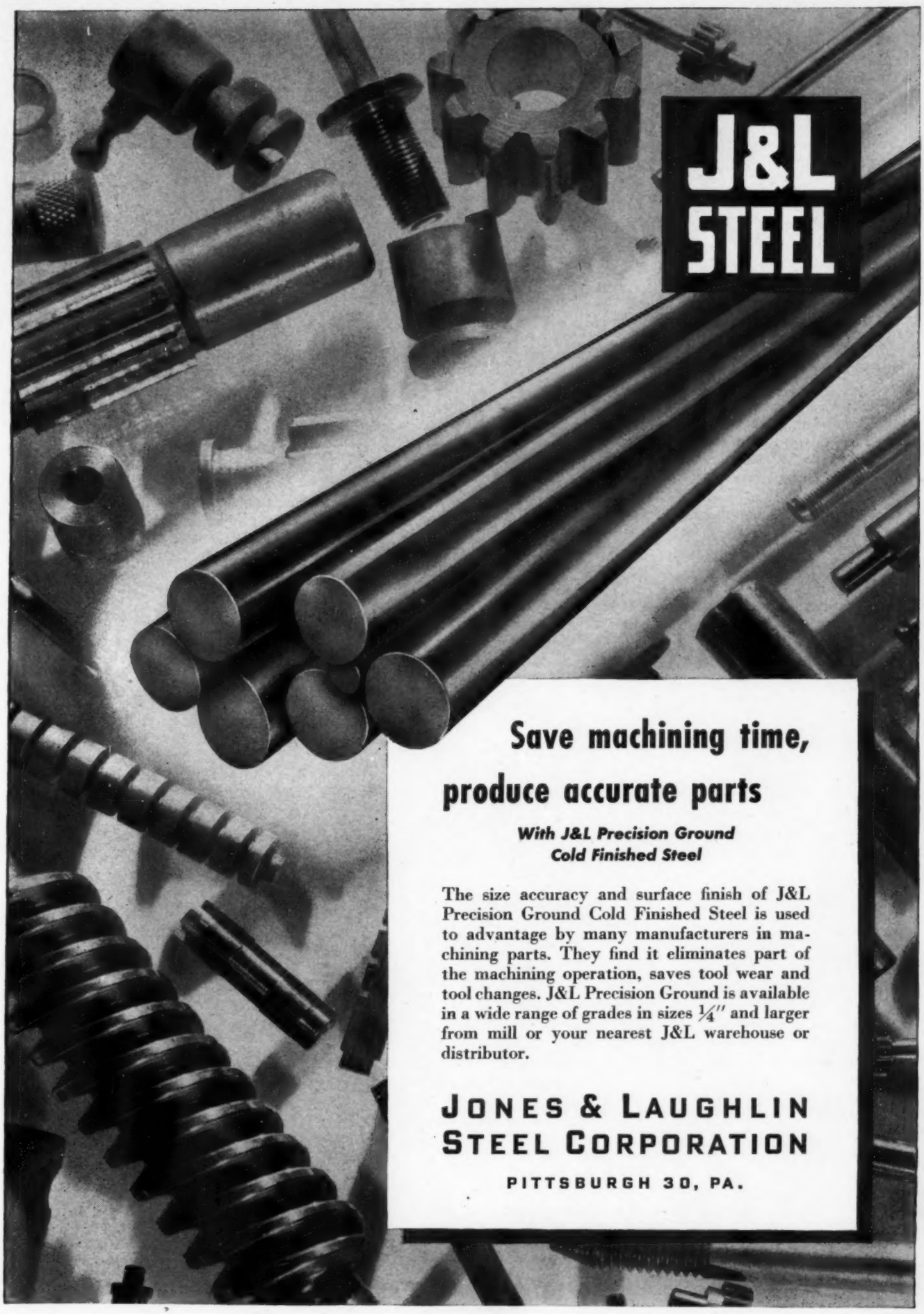


The Model L-4½ toolpost turret designed especially for the LeBlond Dual Drive lathe is announced by Enco Mfg. Co., 4522 W. Fullerton Ave., Chicago 39, Ill. Carbide-tipped tools can be supported by the flat base and clamped with at least three screws. Max. tool size is ⅝x1 in.

The unit has 12 stations with 30° indexing, providing three different working positions for each tool. An equalizer spring keeps toolblock and clamping lever in contact and is said to eliminate chip interference and facilitate indexing. The design provides quick setup for threading.



WASHING MACHINE—Unit washes ball bearings, pays particular attention to races. Vertical pyramidal holders accommodate bearings and move on variable-speed conveyor. Races rotated continuously by means of friction strap, while eccentric sprays are directed between the two races. Handles 1500 to 3000 ball bearings up to 6-in. dia. per hr. Made by Mabor Co., Clark Township, Rahway, N. J.



Save machining time, produce accurate parts

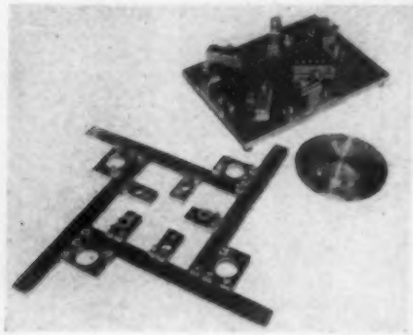
With J&L Precision Ground Cold Finished Steel

The size accuracy and surface finish of J&L Precision Ground Cold Finished Steel is used to advantage by many manufacturers in machining parts. They find it eliminates part of the machining operation, saves tool wear and tool changes. J&L Precision Ground is available in a wide range of grades in sizes ¼" and larger from mill or your nearest J&L warehouse or distributor.

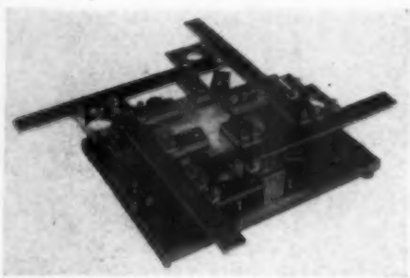
JONES & LAUGHLIN STEEL CORPORATION

PITTSBURGH 30, PA.

Superior Sales Adjustable Jig Provides Basic Jig Members



This Speed-Jig setup is used for drilling five equi-spaced bolt-circle holes in a bearing-retainer plate. The drill assembly (above, foreground) is composed of frame bars, corner plates and bushing plates. The base-plate assembly (background) is composed of work-locating and clamping fixtures, height blocks and clamps for positioning the Speed-Jig over the work. The base plate has a pattern of tapped holes on ¾-in. centers



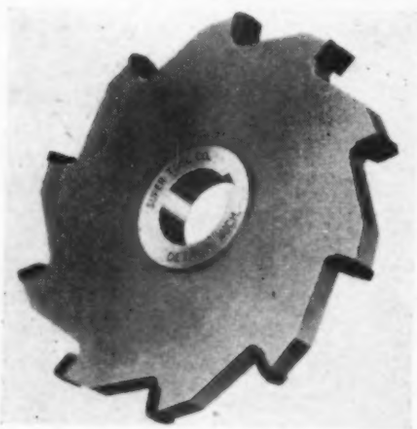
Assembled jig with retainer plate in position as it is handled on the drill-press table

An adjustable jig, the Speed-Jig, is made by Superior Sales and Engineering Co., Cincinnati 2, Ohio. The design provides basic jig parts for similar jobs. The parts can be used, dismantled, rearranged for different jobs and, at any time, reset to previous specifications if a former job is to be repeated. An infinite variety of patterns can be assembled.

The Speed-Jig can be used for transferring hole locations, for layout work, as a master setup for coordinating drill jigs, for drilling sample castings and stampings, and as a temporary jig while production jigs are being made. Hole-layout patterns may be circular, square, rectangular, irregular and in one or more planes. Layouts and dimensioning for Speed-Jigs are said to be easily reduced to drafting procedures.

HANDTRUCK — All-welded unit has large noseplate, rubber-tire ball-bearing wheels, weighs 43 lb., handles loads to 500 lb. Over-all height is 51 in., width at nose is 14½ in. Truck is first product of Sage Equipment Co., 110 Auburn Ave., Buffalo 13, N. Y.

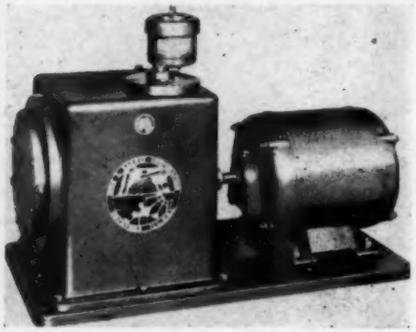
Super Tool Milling Cutters Slot Steel Without Flutter



The Bi-Axial carbide-tipped milling cutter for slotting steel has been announced by Super Tool Co., 21650 Hoover Rd., Detroit 13, Mich. Jobs too difficult for ordinary tungsten-carbide cutters because of flutter are said to be handled successfully by the Bi-Axial.

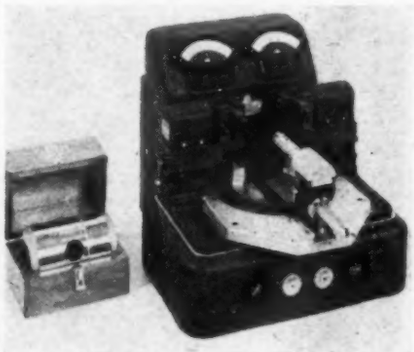
The design incorporates two axial rake angles and negative rake on the blade to provide automatic centering and eliminate flutter. It is said that side wear is eliminated and that close tolerances can be held. The cutter is available in standard sizes.

Rapidraulic Junior Clamp Unit Designed for Rapid Operation



The Rapidraulic Junior hydraulic clamp unit is announced by John S. Barnes Corp., 301 S. Water St., Rockford, Ill. A small, self-contained unit, it is designed for applications requiring a large volume of fluid in a short time interval, followed by a high maintaining pressure. It performs jobs such as actuating lathe chucks or clamp cylinders for fixtures. Maintaining-pressure adjustment is to 500 psi. The motor is from ¼ to ½ hp.

Pratt & Whitney Contour Gage Checks Cam Contour of Pistons



The Electrolimit contour gage, a two-station gaging fixture for checking the cam contour of centerless cam-ground pistons, has been developed by Pratt & Whitney, Div. Niles-Bement-Pond Co., West Hartford 1, Conn.

The piston is mounted on a floating-pressure shoe arbor through the piston pinhole with skirt up. The arbor is pushed into gaging position and locked. Fixed pickup points of two Electrolimit heads contact the bottom piston ring land which has been ground to true circle, while gaging points rest on the bottom of the cylinder skirt. The piston is rotated through 90° either side of center position, while meters indicate variation in cam contour between the ring land and the skirt.

CONTOUR TURNS— AIR-TRACED

for accuracy at high speed

Nine diameters and seven contour rounds—all turned in less than *one fourth* the former time!

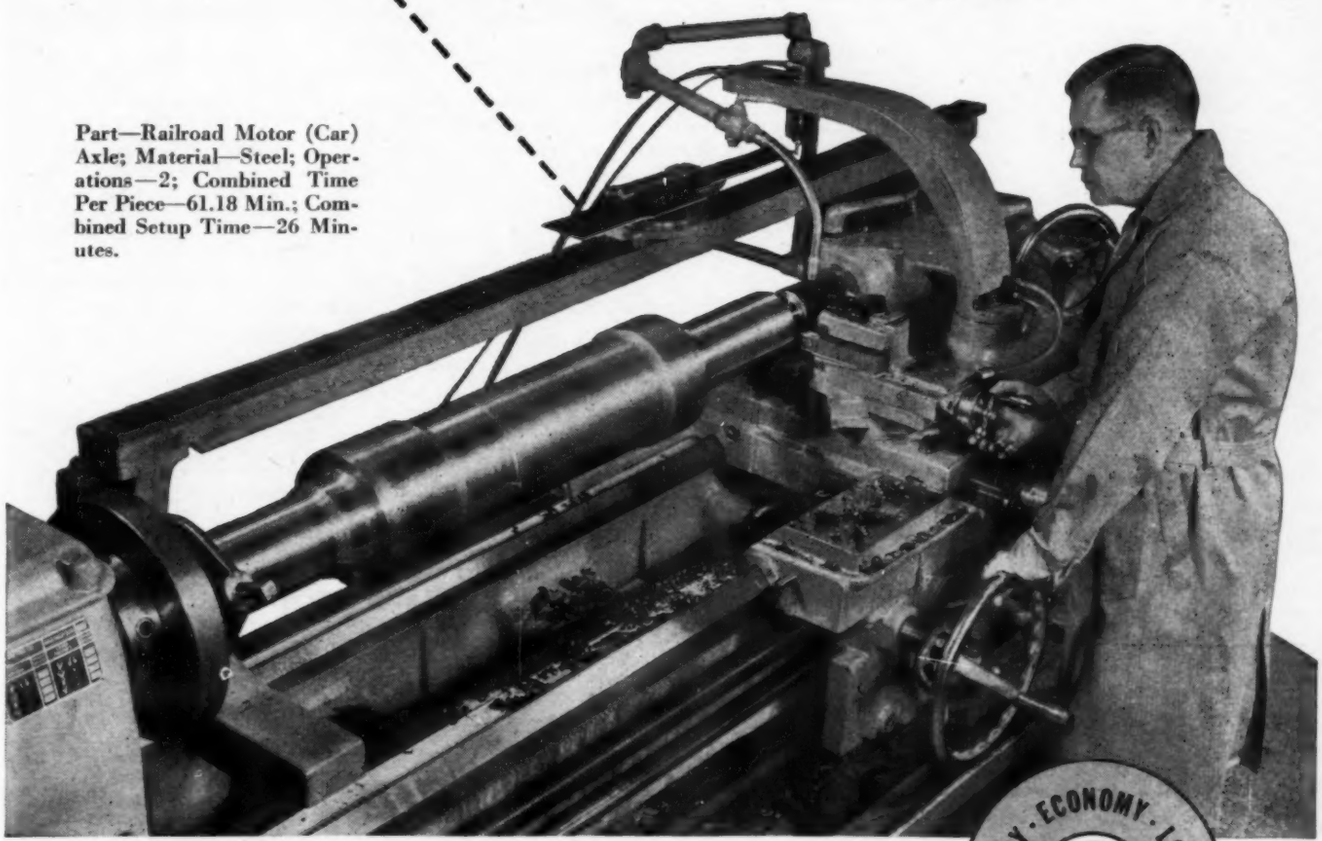
Can you use that kind of increased production? Of course you could—and so could an important railroad customer of ours. That's why they were so delighted with the performance of the Monarch Air-Tracer on this motor (car) axle job of theirs.

But machining time is not the only saving we're making for them. We've cut down on rejects—and we've improved finish and fit. Accuracy is an inherent feature of AIR-TRACING—and since operation is automatic, human errors are minimized.

These advantages are equally available on a wide range of work—boring or turning contours, machining step shafts or ordinary production lathe jobs. For any work of this class you'll find the new Monarch Air-Tracer an efficient, versatile, *economical* attachment. Like more details? Ask for bulletin 2601.

THE MONARCH MACHINE TOOL COMPANY
Sidney, Ohio

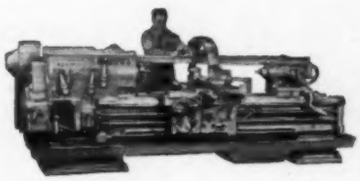
Part—Railroad Motor (Car) Axle; Material—Steel; Operations—2; Combined Time Per Piece—61.18 Min.; Combined Setup Time—26 Minutes.



FOR SPEED, ACCURACY AND FINISH, THE MONARCH AIR-TRACER*

1. Stepless cutting-tool motion provides a superior continuous finish.
2. Setup times averaging five to ten minutes permit profitable use for a wide variety of small-lot production jobs.
3. Automatic yet versatile operation results in economical, accurate high production.

**Available exclusively on the new Monarch Lathes.*



ACCURACY · ECONOMY · LONG LIFE

Monarch TURNING MACHINES

"Sortron-Matic" Gaging Device Inspects 3600 Parts per Hr.

An electronic device which inspects 3600 plastic fountain-pen barrels per hr. has been developed by Federal Products Corp., 1144 Eddy St., Providence, R. I. Built for Esterbrook Pen Co., the "Sortron-Matic" gaging unit inspects for accuracy of diameter and length and sorts the barrels.

A Federal—Foote, Pierson electronic comparator is incorporated. When a part is gaged, an electronic size impulse travels from the comparator to an electronic classifier where it is interpreted. The classified impulse can be used to actuate trapdoors, counter or other devices.

A reciprocating arm picks parts up at the loading table and swings them through inspection to the disposal position. As one part is gaged and ejected, another enters the mechanism. Gravity drops parts through solenoid-operated trapdoors into proper boxes.

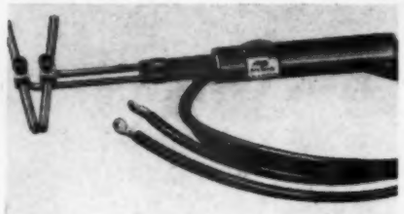
Parts are first inspected for length (over- and under-size parts fall into tote box). Then they are accepted or rejected for diameter (rejects fall into second box). Parts with acceptable length and diameter are sorted into four usable diameter groups which vary by 0.0015 in. Eight separate counts are also taken; four acceptable categories and four reject groups. When any size group reaches 1,000, the machine stops.

Standard Machinery Die Sets Supplied for All Presses

All-steel die sets are offered in a complete range of sizes by Standard Machinery Co., 1565 Elmwood Ave., Providence 7, R. I. The sets can be supplied for all presses and are designed to eliminate the expense of setting up dies every time a job is repeated.

Parts are ground and bored to close limits. Die shoes, punch holders, pins and bushings are interchangeable from stock without rework or fitting.

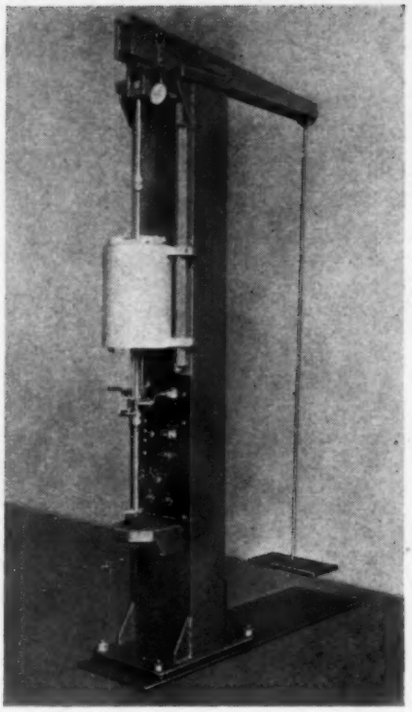
"Knock-Out" Arc-Welding Torch Makes Arc with Slide Control



An arc torch has been added to the line of "Knock-Out" ac. arc-welding equipment manufactured by K. O. Lee Co., Aberdeen, S. D. The unit incorporates feather-touch slide control designed to provide fast make-and-break of the arc flame with a touch of the thumb. When the slide control is off, the torch is said to be shock-proof and safe for adjustment or replacement of carbons. Weight is 1¼ lb., and ⅜- and ¼-in. carbons are used interchangeably without adapters.

Baldwin Creep-Testing Machine Tests Metals in Small Furnace

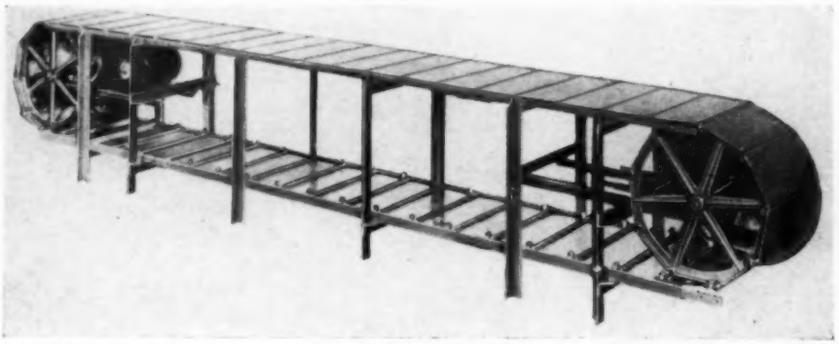
A creep-testing machine which incorporates a small furnace has been developed by The Baldwin Locomotive Works, Philadelphia 42, Pa. Metals can be tested at elevated temperatures to determine creep rate.



Maximum possible elongation of specimen is 1¾ in.

The machine is a lever-arm type. It has 12,000-lb. capacity, and accuracy is guaranteed within 1% of load. Strain indication is by extensometer attached at pinholes at the shoulders of the specimen. It is read directly to 0.000025 in. on a motor-driven revolution counter. The extensometer will operate to rupture, and the accuracy of the strain unit is said to be within 0.00005 in. approximate.

Maximum temperature for the the furnace is 1600 F. Furnaces for 1800 and 2200 F. can be supplied. Temperature adjustment by rheostat permits the specimen to be heated in top, middle and bottom zones.

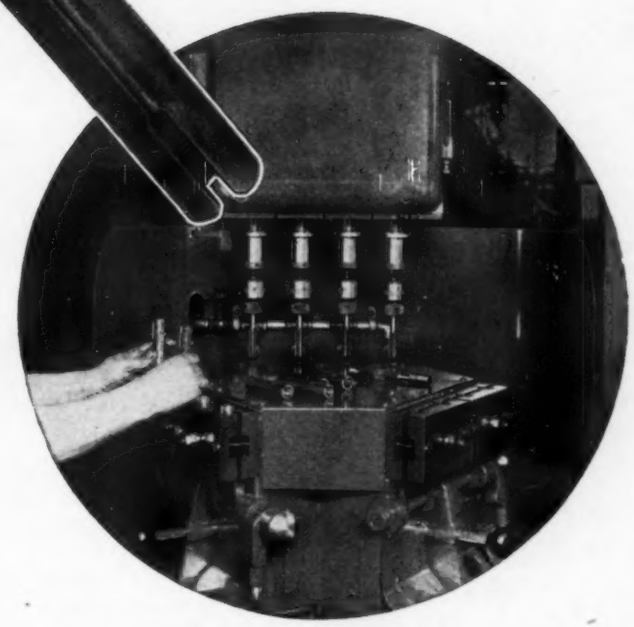


BELT CONVEYOR—Stainless-steel links are now applied to any standard-model all-steel belt conveyor made by Steel-Parts Mfg. Co., 222 S. Morgan St., Chicago, Ill. "Indian grip" connects links so they may be easily removed. Conveyor is made in standard 5- or 10-ft. sections, any of which can be removed or added in from 1 to 2 hr.

Boost Output per grind 185% on turnbuckles

(plus 33% more grinds per tap)

Condition of hole: un-drilled.
Material: SAE 1020 cold-rolled flat stock rolled to shape.
Stock thickness: 0.125 inches.
Length of full thread: 2¼ inches.



The average high speed steel tap produced some 175 pieces in this operation before re-grinding was necessary.

Taps made of "M-11" (Detroit Tap's exclusive chrome-cobalt HSS) however, average 500 finished turnbuckles per grind. In addition, it was found possible to re-sharpen the "M-11" taps 8 times as against 6 for conventional HSS.

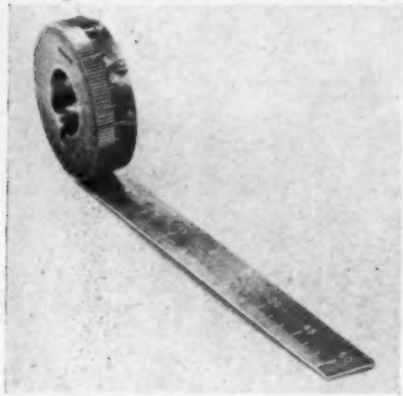
Equipment now used to produce some 12,000 parts per machine per 24 hour day are two specially designed "Detroit" 4-tap multiple head lead-screw machines with indexing fixtures, having automatic clamping, automatic unloading and simple manual loading. Spindle speed is 250 RPM while tapping, 500 RPM for backing out. Taps are 11/16" – 18 RH and LH, and of course are "M-11".

***M-11 steel is used exclusively in Detroit taps, thread milling cutters and thread plug gages.**

The reason why taps of M-11 steel* give such outstanding performance is that the steel has higher abrasion resistance (longer life); higher toughness with hardness (less chance of breakage or chipping); higher red hardness (efficient tapping at higher speeds); and higher torsional strength (greater resistance to twisting and breakage). Yet they cost no more.

DETROIT
TAP & TOOL CO.
8432 BUTLER AVE. • DETROIT 11, U.S.A.

Acromark "Vari-Angle" Engraving Designed for Precision Marking

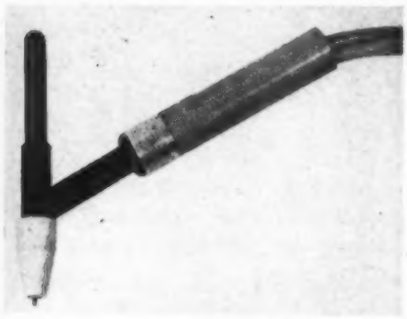


A development by The Acromark Co., 7-13 Morell St., Elizabeth, N. J., is said to provide a means to insure accuracy in roll marking comparable to straight stamping. The "Vari-Angle" method of engraving is employed, and the accuracy of roller dies comes from the angle of engraving characters around the periphery of the roll.

The engraving is done at an angle or bevel so that, as the roll advances in a marking operation, the impressing face of the character will be fully supported and give direct contact, while the releasing portion of the character will fall clear of the impression when it leaves. In prior methods the character struck the material to be marked from the side of the engraving rather than from the center of the character.

The roller die, when used in a precision marking machine with geared control, can mark items such as dials and calibrated pieces. It can mark calibrations with numbers or letters.

Linde HW-4 "Heliarc" Torch Shields Weld with Inert Gas



The HW-4 "Heliarc" torch for inert-gas shielded arc welding is announced by The Linde Air Products Co., Unit of Union Carbide and Carbon Corp., 30 E. 42nd St., New York 17, N. Y. The torch employs a ceramic gas cup to prevent arcing to adjacent areas and to shield the weld area from the oxidizing atmosphere under a blanket of inert monatomic gas. Metals such as Monel, aluminum, magnesium and stainless steel are welded without the use of flux.

The torch is water cooled, making possible the use of a light, flexible power cable carrying up to 250 amp. If water stops flowing or the torch becomes overheated, a safety fuse shuts off power. Straight- or reverse-polarity dc., or high-frequency stabilized ac. can be used. An electrode extension with removable cap provides easy adjustment of the tungsten electrode.

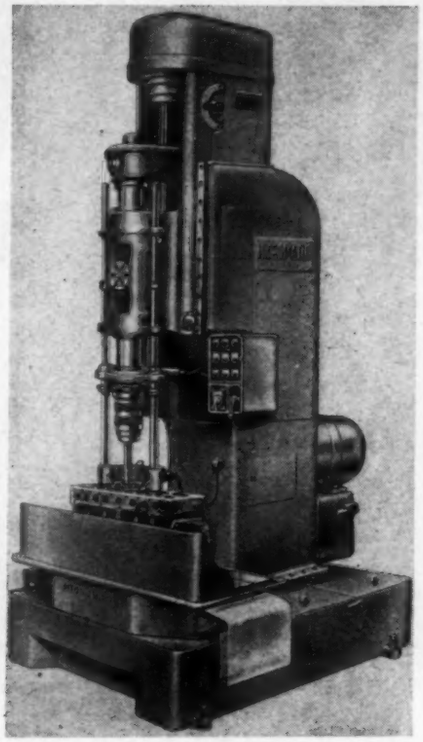
Sheffield Automatic Machines Weld Contact Points or Disks

Automatic welding machines which handle contact-type points or disks have been announced by Sheffield Corp., Dayton 1, Ohio. Originally developed by Western Electric, they have been redesigned and improved by Sheffield.

Electrical-contact material is said to be securely placed on contact springs at high production speeds on either type of machine. The spring is loaded on a holding fixture and moves through a series of stages. On the disk machine the disk is punched, placed on the spring in proper location, the two parts are welded together, and then the contact is shaped to required contour.

The machine has a capacity of 83 cycles per min. Production varies from 1200 to 2400 contacts per hr., depending on operator's ability to load springs in the holding fixture.

Micromatic Microhoning Unit Incorporates Unit-Type Design

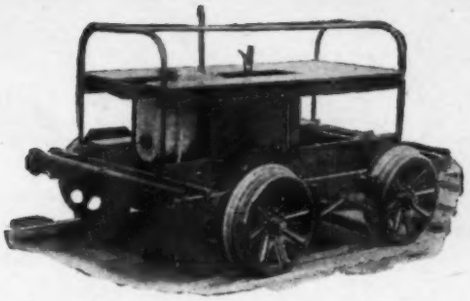


A heavy-duty honing machine with a single quill-type spindle has been added to the line of Microhoning machines made by Micromatic Hone Corp., 8100 Schoolcraft Ave., Detroit 4, Mich. It will hone bores from 1- to 4-in. dia. up to 9½ in. long.

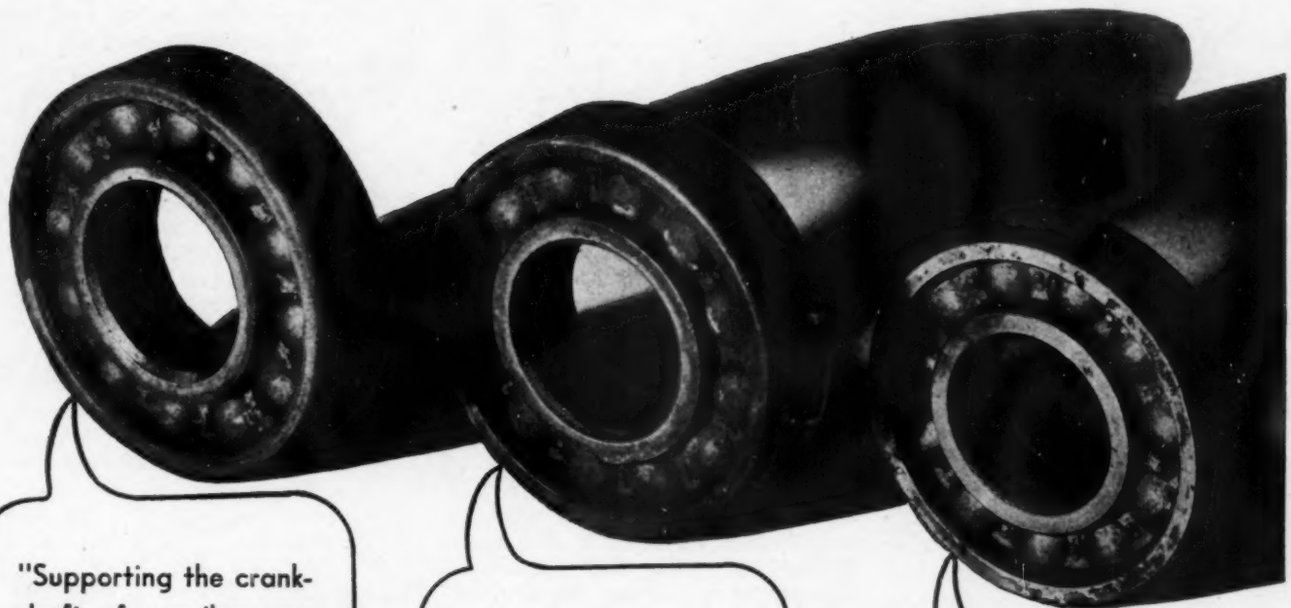
A unit-type design is incorporated to increase the adaptability of the machine. Three units are assembled on the column and base of any other Micromatic Microhoning machine so that requirements of the part to be honed can be met by standard assemblies. First unit is the heat unit which is composed of spindle, hydraulic-control panel, stroke-control mechanism and speed-control transmission—all in one integral assembly. The hydraulic unit includes hydraulic pump, tank and pressure-control valves. The third unit is the electric-control panel.

Weight that must be reciprocated to stroke the tool has been minimized so that stroke can be fast without increased power input. Stroke control is direct without linkages or levers. Spindle alignment is said to be accurate, because torque and thrust are taken by the quill above the tool. Precision depends on a controlled axial and lateral float of tool in relation to bore being honed. This permits plain spindle bearings. The unit illustrated has automatic Microsizing control.

"We've been working on the railroad" for 23 YEARS



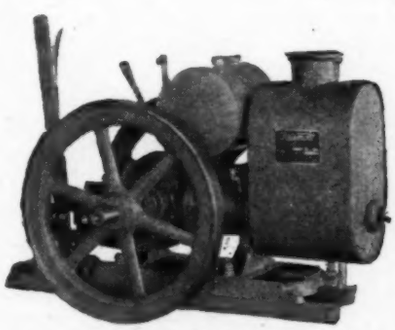
New Departure ball bearings served in the Fairmont Engine in this railcar since 1924.



"Supporting the crankshaft of a railcar engine is dirty work. We admit we've never had a bath; that's why the sludge and carbon."

"New Departure ball bearings are precision products—yes, but we also have to be mighty tough to take 23 years of this kind of work."

"We're a bit loose due to fighting abrasive matter, yet we're whole and with lots of 'go' left. And modern New Departures are even better bearings."



Fairmont QHB Engine
New Departures on Crankshaft

Uninhibited engineering resourcefulness makes New Departure a wise choice for your products and production machines. Tell us your needs.

nothing rolls like a ball

NEW DEPARTURE

BALL BEARINGS

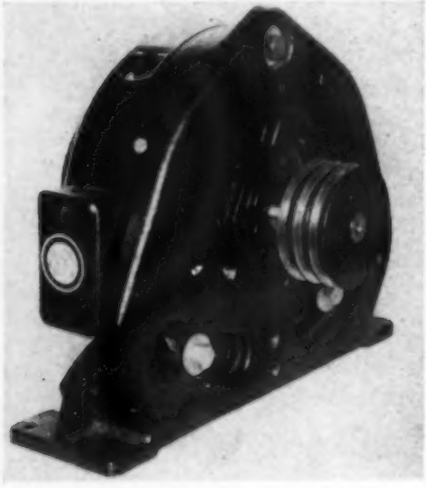
3480.

NEW DEPARTURE • Division of GENERAL MOTORS • Bristol, Conn. • Branches in DETROIT, CHICAGO, LOS ANGELES and Other Principal Cities

Parts and Materials

Axial Air-Gap Electric Motors Built by Fairbanks, Morse

Length of the axial air-gap motor is approximately one-half that of a conventional motor of the same rating. Weight reduction is about 30%



A sliding base can be used for chain, belt or V-belt drives. Belt tension is adjusted by pivoting the motor about the top supporting screw. By incorporating pivots and slots in the frame of the machine, the base can be eliminated

"Axial Air-Gap" ac. electric motors have been made commercially practical by Fairbanks, Morse & Co., Freeport, Ill. Besides providing reductions in size and weight, the motors can be easily cleaned, inspected and lubricated. They are especially acceptable as flange-mounted motors because of small overhang. Distinguishing principle is that magnetic lines of force follow a path parallel to the axis of rotation as compared to the radial path taken by magnetic flux in conventional motors.

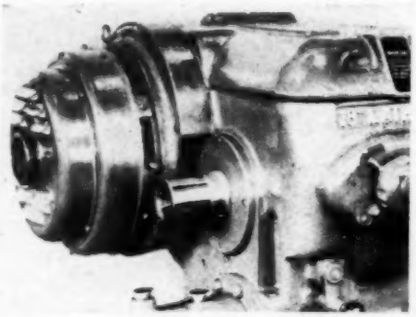
Principal weight reduction is due to the fact that the corner waste of conventional motor laminations is avoided. Spiral winding of the strip for stator and rotor makes possible a 30% saving of electrical steel. Considerable size reduction comes from placing the supporting frame in the center of the motor.

The motors are available from ½ to 10 hp. in 2- and 3-phase types, and in ½ to 3 hp. in capacitor-type single-phase units.

Speed-torque characteristics, starting and running currents, temperature rise and other performance factors are practically the same as for the conventional motor. The flywheel effect (WR^2) is approximately three times as large. This is advantageous in applications such as punch presses, but a disadvantage in applications where repeated plugging and reversing are essential.

Primarily a flange-mounted motor, it is the same whether mounted horizontally or vertically. Only the cover is changed. When flange mounted, frame and bearing supports are of one piece so that accuracy of the flange, such as face runout, concentricity and shaft runout, can be held to close limits. The axial air-gap is highly suited to gear motors where it is mounted as part of the unit.

The motor can be easily inspected, lubricated or cleaned by removing the cover. The rotor is fully exposed to ventilation, and fans are cast integral with the spider, making the motor easy to cool.



Compactness of the motor is shown in this application of a 10-hp., 1800-rpm. unit mounted horizontally on a Lodge & Shipley lathe

An exploded view shows, from left to right, conduit box, cover, rotor and stator

TWO OUT OF THREE

Industrial concerns prefer NICHOLSON FILES

NICHOLSON file brands enjoy a wide margin of user preference. This fact is indicated by the millions of files the Nicholson factories turn out annually. It is supported by the many industrial distributors' customer accounts which include these famous brands as items. It is substantiated by specific surveys conducted by impartial agencies. . . . They show Nicholson brands leading the field by more than *two to one*.

The big reason, of course, is that these files have everything which the user has every right to expect:

QUALITY — in steel, design, sharpness and long serviceable life — that through man-hour savings can readily cut file costs to the vanishing point.

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The best distributors in every industrial area sell Nicholson or Black Diamond file brands . . . because they find it to the best interests of both their customers and themselves.

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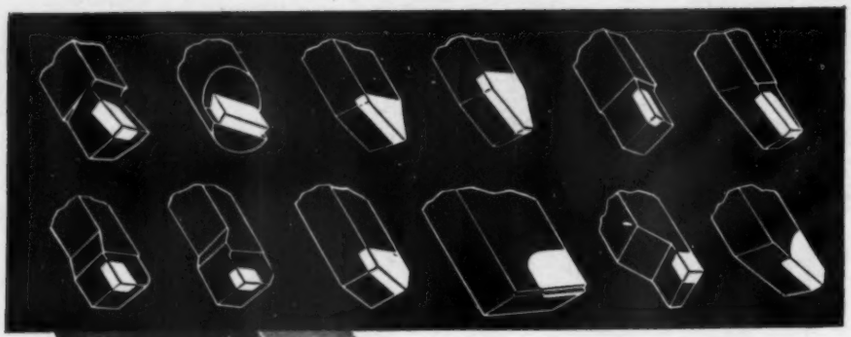
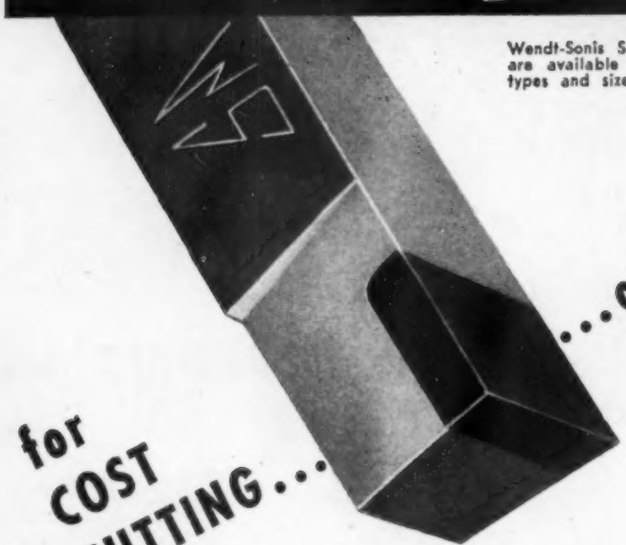


Wendt-Sonis Standard Carbide Tools are available in a wide variety of types and sizes.



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. . . on CUTTING JOBS

- *13 standard Wendt-Sonis carbide tipped tools will perform over 80% of a plant's tool bit operations.*
- *Wendt-Sonis standard tool bits can be supplied with any grade of carbide required.*
- *Standard Wendt-Sonis tool bits are stocked in Carboloy and Kennametal grades of carbide for universal machining operations.*
- *Nationwide sales and service organization of established W-S distributors stocks a complete line of W-S standard products.*

W-S standard tool bits are "Color Marked" for easy identification as to use on steel or non-ferrous materials. All shanks are rust resistant — also heat-treated for greater rigidity. Cutting edges are diamond ground for longer wear and better finish. All these advantages put the Wendt-Sonis line at the top as a money maker for you. Get details!

Free! NEW CHIP-BREAKER CHART

Contains illustrations of chip-breakers, grinding instructions, and recommendations for their use. Chart size — with handy tab for wall hanging. To get FREE chart WRITE: Wendt-Sonis Company, Hannibal, Missouri or 580 N. Prairie Ave., Hawthorne, Calif.

WENDT SONIS

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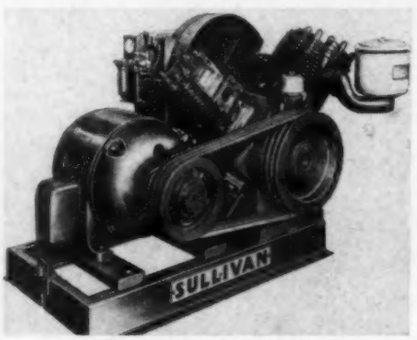
Garrett Diamond G Spring Nut Locks Bolt in One Operation

A spring nut and a spring locknut have been placed on the market by George K. Garrett Co., 1421 Chestnut St., Philadelphia 2, Pa. One is said to replace the conventional nut and is called the Diamond G spring nut. The other is designed to supply action similar to a locknut.

The spring nut is said to assure positive locking operation on the bolt in one assembly operation.

"Unitair" Air Compressors Are Air Cooled, Two Stage

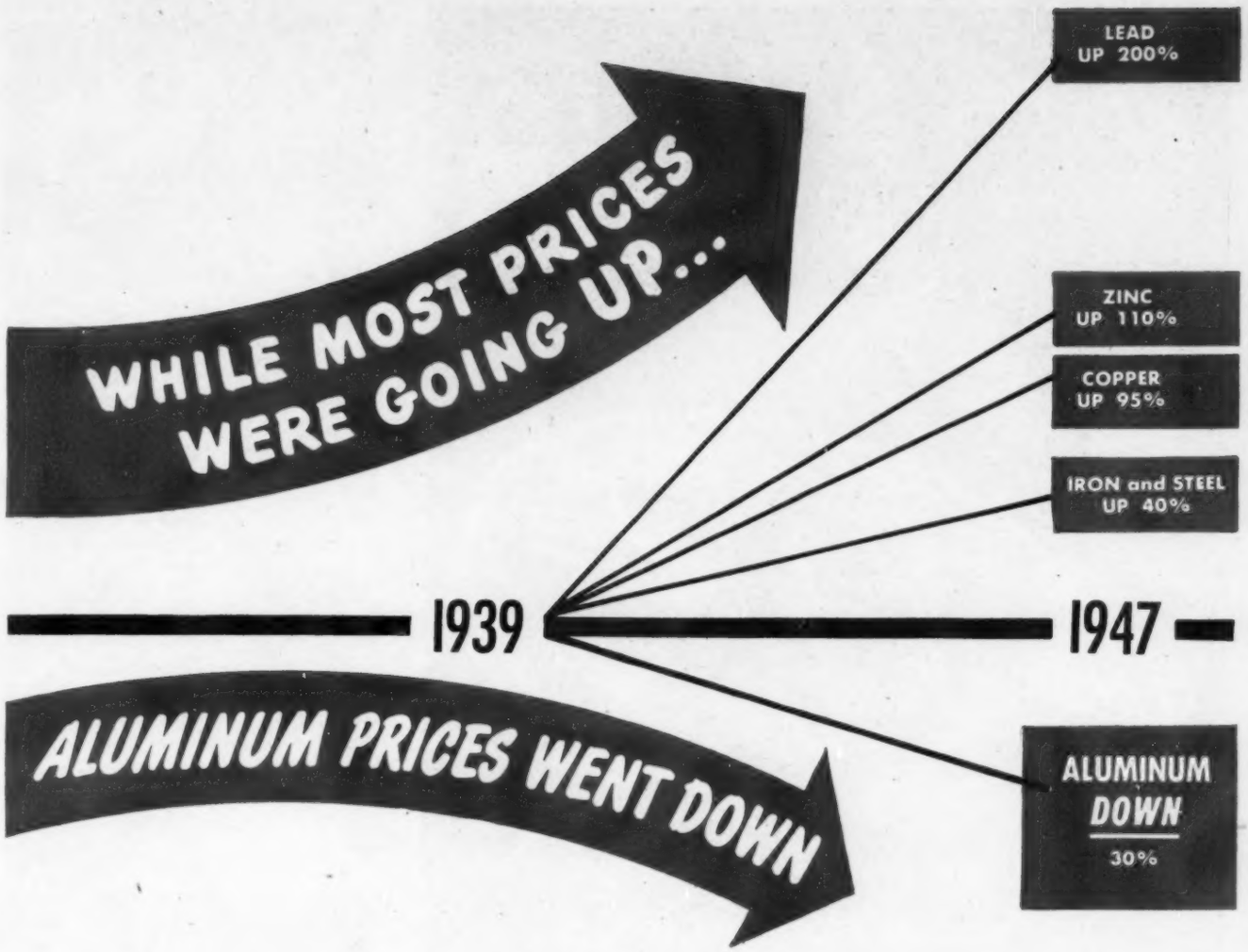


The "Unitair" line of two-stage air-cooled stationary air compressors has been placed on the market by Sullivan Div., Joy Mfg. Co., Oliver Bldg., Pittsburgh 22, Pa. Compressors are available in nine sizes with power requirements from 15 to 100 hp. Piston displacements are from 81 to 590 cfm. at 100-psi. discharge pressure based on 60-cycle motor speeds.

Electric drive may be by built-in motor, direct-connected motor or V-belt drive. The units may also be equipped for use with gasoline or diesel engines. Air cooling eliminates the need for water piping. Force-feed lubrication is employed, and "Cascade" oil cooling is used to reduce oil consumption and sludging.

Watson-Standard Co. P-5 Finish Protects Metal, Wood, Concrete

P-5 anti-corrosive, fast-drying, Co-Polymer finish is available from Industrial P-5 Div., The Watson-Standard Co., Pittsburgh 12, Pa. It is recommended for protection of metal, wood and concrete against moisture, acids, alkalies and other agents. The substance dries by evaporation without requiring an oxidation period. Made in nine colors, it is said to have good thermal stability and high resistance to abrasion and scrubbing. It does not oxidize or become brittle.



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Consider Aluminum . . . Consult Reynolds. Reynolds technicians will be glad to discuss with you the many new ways in which aluminum is serving industry. Write Reynolds Metals Company, 2525 South 3rd St., Louisville 1, Kentucky.

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REYNOLDS METALS

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Engineers of the Crown Cork and Seal Company specified Ampco Metal for the filler gear on Cem bottling machines—for longer life and lower maintenance costs. Segmented design makes maintenance easier, when required.
Geared for the battle—
against bottling costs — with Ampco Metal, the modern aluminum bronze

extreme operating conditions — wear, impact, fatigue—meet their match in durable Ampco Metal

It's good strategy to concentrate strength at the point of attack — that's why designers specify Ampco Metal for critical machine parts like the gear illustrated above. Ampco Metal's *extra* wear-resistance means longer life and trouble-free service for parts subject to extreme operating conditions.

Ampco Metal is a superior aluminum bronze of closely controlled quality — far more durable than ordinary alloys of this type. It is lighter and stronger than other bronzes — and an exceptionally good bearing alloy. Specify Ampco Metal for parts that must operate dependably when subject to impact and fatigue, compression, corrosion, or extreme temperatures.

Let your nearby Ampco engineer help you select the proper grade for your requirements from the seven standard grades and several modifications available. For complete information on Ampco Metal, write for Bulletin 71 today!

Ampco Metal has 7 outstanding performance advantages . . .

Excellent bearing qualities • High strength-weight ratio • High compressive strength • High impact and fatigue values • Corrosion-resistance • Efficiency at extreme temperatures.

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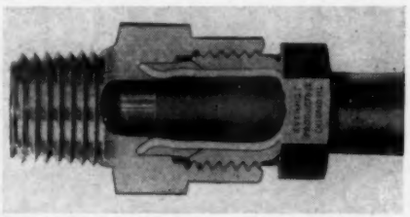
AD-29A

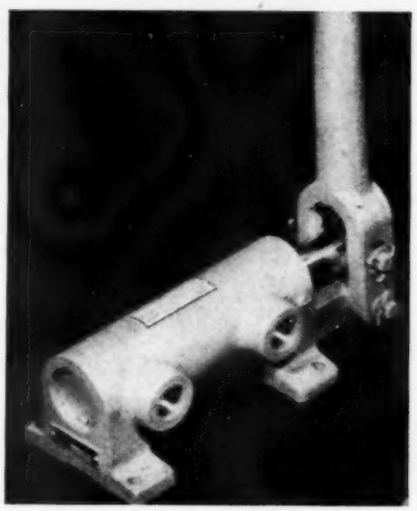
Everseal Self-Flaring Fittings Provide 37° Flare on Steel Tube



Everseal self-flaring fittings are announced by Everhot Products Co., 2001 W. Carroll Ave., Chicago, Ill. The units are said to obtain a 37° leakproof flare and assemble in one operation. Fittings are two-piece brass units, will flare steel tubing, and withstand 8600-psi. pressure. They can also be used with copper, aluminum, monel or Bundyflex.

The tube is inserted in the fitting until it rests on the annular seat. As the nut is screwed into the fitting, the tapered sleeve on the nut is wedged between tube and fitting wall and shears off. Wrench action on the nut drives the sleeve further into the fitting, forcing the tube into the recess and forming the flare.

Electrol Hydraulic Hand Pump Is Double-Acting, Weighs 8 Lb.



A double-action commercial hydraulic hand pump is made by Electrol, Inc., Kingston, N. Y. It weighs 8 lb., has 1¼-in. bore, 1¼-in. stroke. Volume is 1.5 cu. in. per cycle. Operating pressure range is from 0 to 1500 psi., and the load on the handle at 1500 psi. is 52 lb., at 500 psi. is 17 lb.

The metal pump handle has a round plastic knob, travels through a maximum arc of 60° and is 22 in. long. The pump housing is only 7-3/16 in. long. Suction and pressure ports are located on the same face. The double-acting pump requires no suction stroke.

THE PROOF OF THE DIE . . . IS IN THE STEEL

Heavy-duty dies cost many times the value of the steel from which they are made. Skilled die-makers must put in many long hours to insure split-hair accuracy. Equal care must be devoted to the heat-treating, finishing, and other critical operations.

But, unless they can produce and stand up under severe service, finished dies are worth nothing more than their weight as scrap. That's why it's so important to select the proper steel for dies. The best in workmanship and heat-treatment can't make a high-production die if the steel isn't right.

Bethlehem die steels have been proved by years of making good in tool and die shops. The popular grades are:

X, XCL, XX (Carbon Tool Steels) general-purpose, water-hardening

BTR (Bethlehem Tool Room) safe, oil-hardening

B A-H (Bethlehem Air-Hardening) non-distorting, air-hardening

Lehigh H (Lehigh Die, H Temper) high production, air- or oil-hardening

Each of these specialized steels has properties which make it the best choice for some specific requirement.

Whatever your die-making problems may be, you can look to Bethlehem for the "know-how" on die steels. The nearest distributor or district office will gladly give you detailed information.

Bethlehem Steel Company, Bethlehem, Pa.

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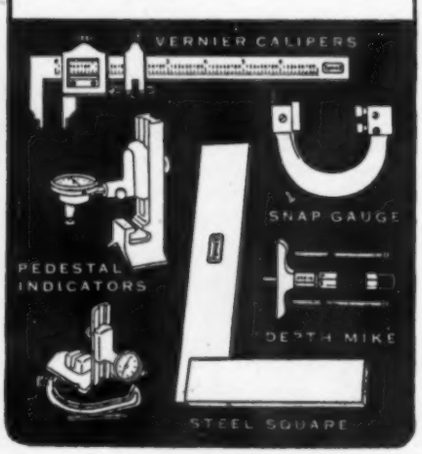

ROUND TABLE Discussion

SHOULD A MAN OWN HIS OWN TOOLS?

No craftsman with pride in his craft—and unless he has pride in it he is no craftsman—would be without his kit of tools. A man gets to know the feel and touch of his own tools and has complete confidence in them. Naturally, the more expensive forms of gaging equipment, elaborate sets of Johannsen blocks, screw-thread gages, etc., are supplied by the employer. On the other hand, any worthwhile craftsman will have such tools as small micrometers, a good vernier caliper, a selection of rules, calipers, dividers, surface gage scribers, punches, a screw pitch gage, a first-class plain square and a combination square, an eye-glass, etc. They are almost as much a part of a man as his clothes.

Anything which encourages pride of craft is itself to be encouraged to the utmost. It would perhaps be too much to say that you can judge a man by his tool kit, but it is a pretty good indication of his abilities, for a man with a comprehensive tool kit is usually a good craftsman, and if his tools show a lot of wear and tear, so long as it is fair wear and tear, the evidence in his favor is strengthened.

K. N. Harris
Harrow, England

•

SNOOPERVISOR

In the light of my shop experience, the foreman who is known as a square shooter can make notes on the job and still be above suspicion. His reputation is sufficient guarantee to the men that his note-taking will not be used to their disadvantage.

In fact, I know one busy foreman who supervises a force of over one hundred men and he frankly admits his dependence on a notebook. His men, on the other hand, appreciate the value of his note taking when it comes to the question of adjusting grievances, granting pay rises, or making suggestions. The fact that the boss put it down in the little black book satisfies Bill or Joe that the matter will be given prompt attention. They know from experience that the boss sits down at the

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30 TON
PRESS-RITE
PRESS

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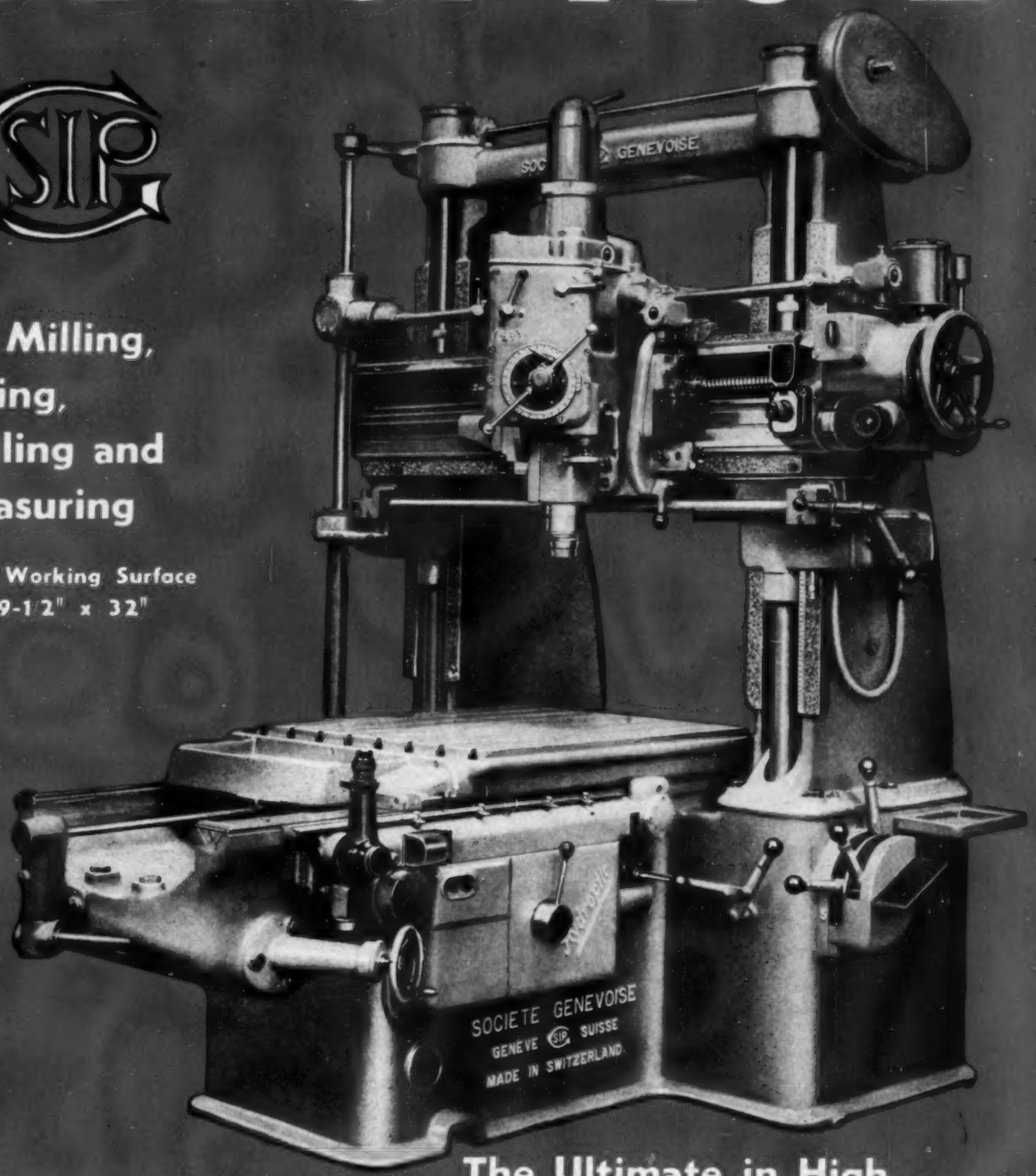

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4 INTERCHANGEABLE CENTER INSERTS

Only one live center needed to handle a wide variety of work. Just change insert—male, plain female, female with raised lands, pipe. Also "Heavy Duty" type—built for heavy work.

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Successor to Ideal Commutator Dresser Co.
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end of a busy day and goes over the day's notes—and sees to it that action results.

In contrast to this efficient method, I can recall foremen who relied on mental note-taking as they went through the shop to keep them posted. A simple request for a tool would be filed under the boss's hat and frequently forgotten before he got back to the office. By the time he was reminded and the tool procured, valuable time had been lost. These mental lapses piled up in the course of time an astonishing amount of indifference on the part of the men.

To sum up, the average workman expects the foreman—in view of his position as a representative of management—to be mentally alert in all matters that affect the smooth running of the shop and the welfare of its personnel. If he falls down through inattention to details, he loses their respect and cooperation. Recognizing the fallibility of the human memory, the wise foreman will take notes—and what is more important—act on them as soon as possible.

Robert S. Alexander
East Providence, R. I.

•

Men who work for a week's wages and have a boss do, generally speaking, fear for the security of their job and consequently are unduly conscious and sensitive to the actions of their superiors.

Consider a case in point. I'm employed as a toolmaker. One day, I asked the boss for a raise. "Well," he said, "Just wait a while. Our costs are too high just now. A recent job ran $900 over our estimate. Also, the "super" was snooping around yesterday and he saw so-and-so changing his shoes ahead of time, etc., and he didn't like it. Of course," the boss added, "I don't mean he has anything against you, but just wait a week or two."

You see what I mean? Men don't need outward evidence of supervision such as a notebook to be cautious, even suspicious. A little depends on an individual's characteristics, too. Some citizens have a healthy respect for officers of the law. A little fear, whether or not increased by a guilty conscience (if one is present) heightens this respect.

Maybe the man in a responsible position needs a notebook to aid his memory. Isn't this tolerable?

Edward Diskavich
Torrington, Conn.

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FAST FEED PRESSES
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Anyone can operate a Dahlstrom Tap Guide. Just fasten it to a post, slip a Tap Adaptor into the spindle and turn the handle. Cuts tap breakage down to zero—and saves those countless hours that are spent trying to pry broken taps out of dies. Comes equipped with 7 Adaptors, ranging from 8-32 to ½", which takes care of 95% of all tapping requirements. (Taps are not furnished.) 12" x 6" x 14" high. At mill supply houses, or order direct. Literature on request.

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TIP DESIGN

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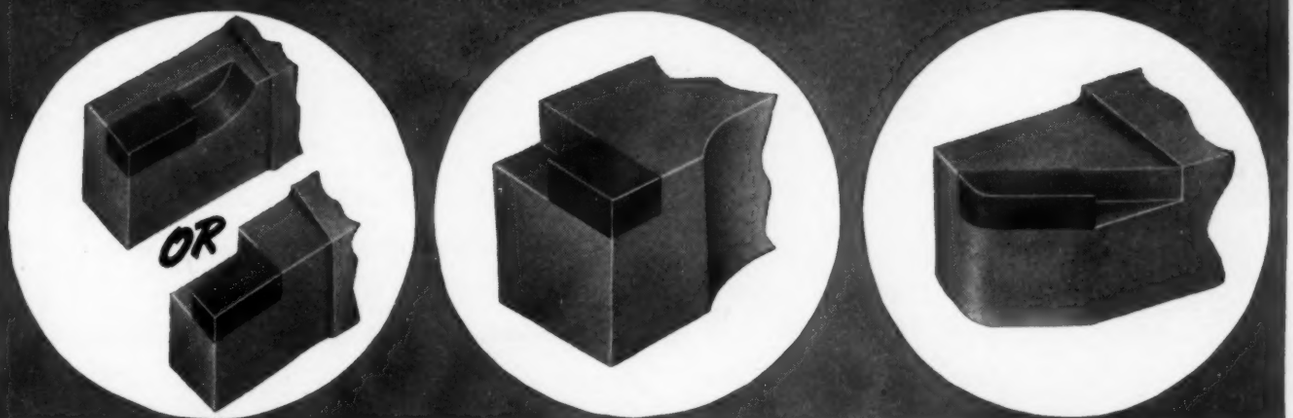
ELIMINATE SLOW, COSTLY TIP RECESSES

AVOID BRAZING STRAINS—CRACKED TIPS

MAKE TOOLS *FASTER, CHEAPER AND BETTER* BY "SLASH" MILLING!



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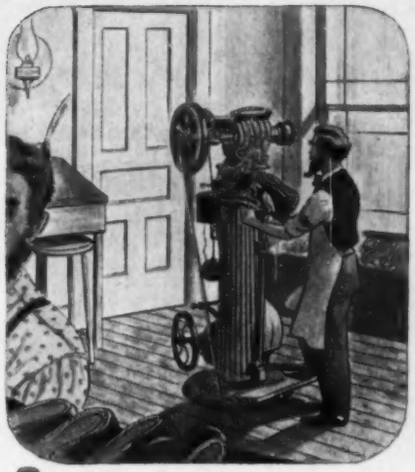
1 **1851**—John Nichols, a Lynn Shoemaker, adapted the Howe sewing machine to sew the uppers of shoes, doing away with the slow process of hand sewing. This started a fever of invention and innovation in the shoe industry in America that has carried to the present day.

2 **1858**—Lyman R. Blake, of South Abington, Mass., invented a machine to sew soles to uppers. This was subsequently improved by Robert Mathies and manufactured by Gordon McKay. It became famous as the McKay sewing machine . . . set the stage for more progress.



3 **1862**—Goodyear Welt Machine ushered in the third stage. In 1890, electric motors arrived. By 1915—Howell began specializing in industrial type motors. Soon, Howell Red Band Motors, specially designed for application in this and other industries, made their appearance.

Three stages to big business in shoes!

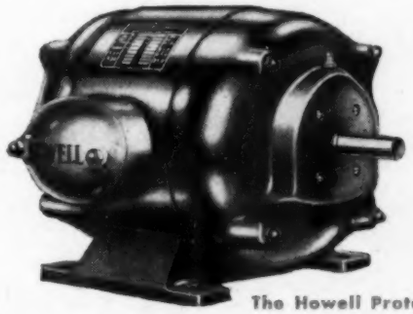
4 **Today**—The shoemaker's kids have shoes! America is the biggest producer of shoes in the world.

The application of specially designed machines, individually powered with industrial type electric motors, has played a vital role in stepping shoemaking into big business . . . improving quality . . . cutting costs.

You can work wonders in your business, too! Investigate now and remember Howell Motors are tried and proved industrial type motors. They are precision-built and designed for the toughest operating conditions—consequently, they will perform better on all jobs.

Try them NOW!

Be wise—meet competition with modern machines powered by industrial type Howell Motors. They're precision-built!



The Howell Protected Type Motor

HOWELL MOTORS

HOWELL ELECTRIC MOTORS CO., HOWELL, MICH.

Manufacturers of Quality Industrial Type Motors Since 1915

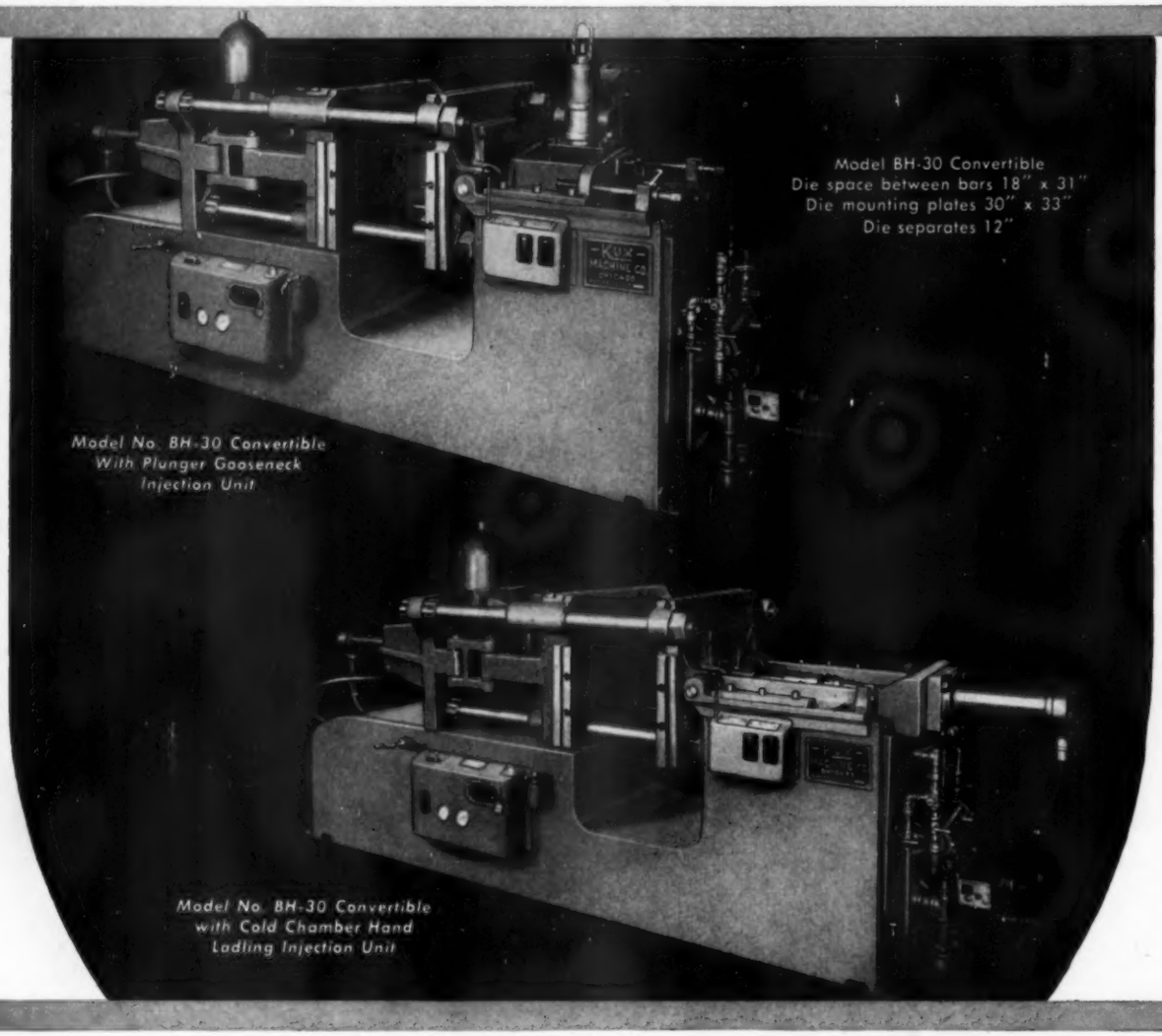
CONVERSION FROM ZINC TO ALUMINUM DIE CASTING

in less than an hour on

KUX CONVERTIBLE MACHINES

In less than an hour's time, Kux hydraulic machines can be adjusted for die casting zinc alloys using a plunger gooseneck metal injection unit or for die casting aluminum brass or magnesium alloys using a cold chamber hand ladling injection unit.

This change over is a simple easy operation on any of the Kux machines from Model BH-18 to Model BH-30 which are available as convertibles. The removal of a few mounting screws and pins and the attachment of either injection unit, both completely self-contained, rapidly readies a machine for production. Only on Kux Die Casting equipment can you find so many superior design features that offer such a multiplicity of usage for each machine. Write now for illustrated catalog.



Model BH-30 Convertible
Die space between bars 18" x 31"
Die mounting plates 30" x 33"
Die separates 12"

Model No. BH-30 Convertible With Plunger Gooseneck Injection Unit

Model No. BH-30 Convertible with Cold Chamber Hand Ladling Injection Unit

KUX MACHINE COMPANY
3922 W. HARRISON STREET • CHICAGO 24, ILLINOIS

. . . COSTS TOO HIGH?

THEN YOUR *SAVINGS* WILL BE EVEN GREATER WITH

SPEED CASE x1515 STEEL

LOW CARBON OPEN HEARTH FOR CARBURIZING

SPEED CASE machines freely at 250 S. F. P. M. with exceptional finish maintained. Distortion from carburizing is practically eliminated. Many plants are saving enough on rejections and increased production, which in many cases is 100%, to PAY FOR THE STEEL. SPEED CASE replaces C1117, C1118, B1112, B1113, C1019, C1115. Reduce your inventory, increase production, cut your manufacturing costs with SPEED CASE. The chances are that this steel is the answer to your present worries about production and labor costs . . . at least *find out about* SPEED CASE STEEL.

SPEED TREAT STEEL
Medium High Carbon for Heat Treating

NOTE: Except for "Wire Sizes" we are in good position to make reasonable deliveries. Write for SPEED CASE & SPEED TREAT CATALOG.

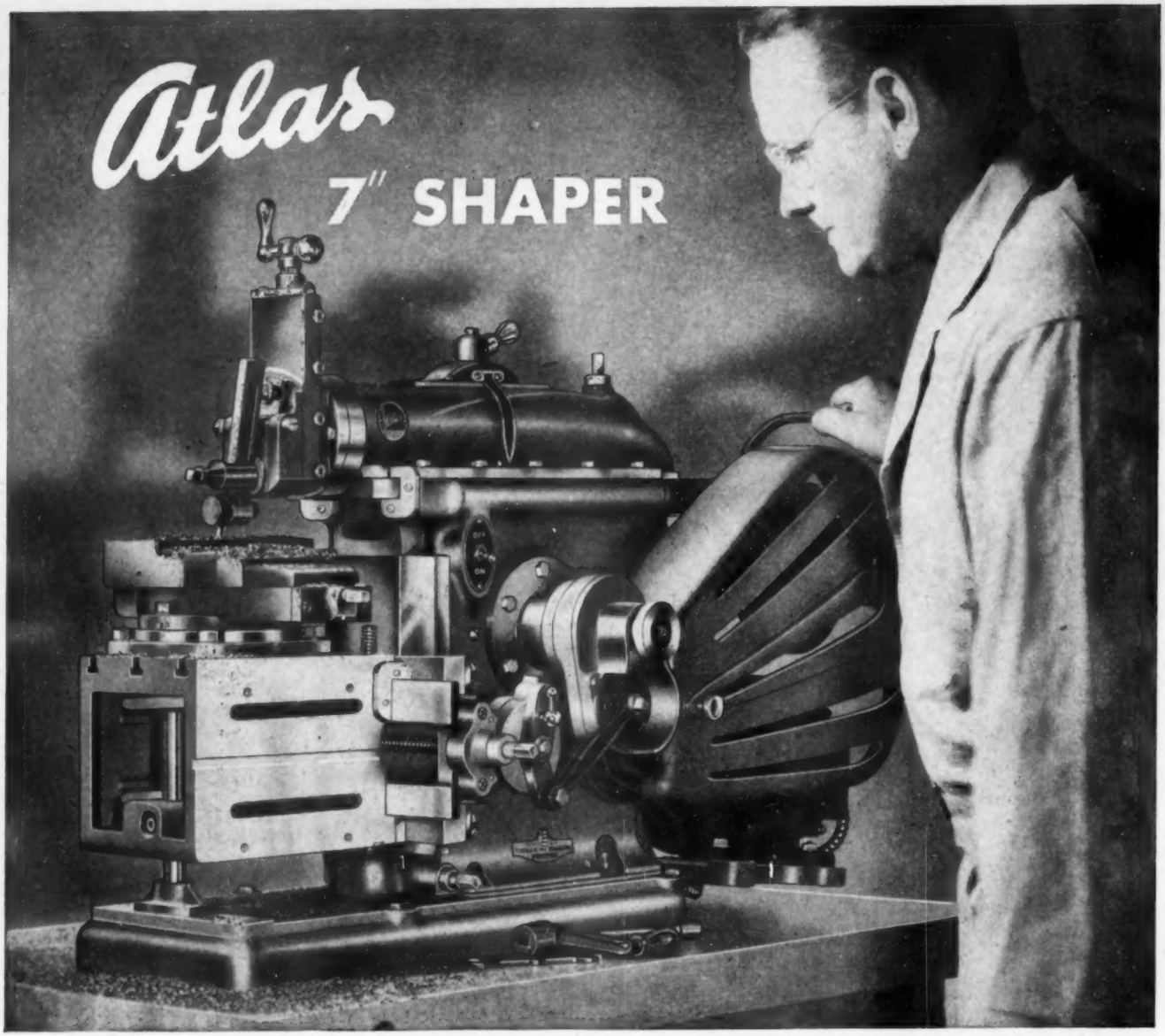
Tear off here ATTACH TO YOUR LETTERHEAD AND MAIL TO EITHER COMPANY BELOW

Licensee for Eastern States
THE FITZSIMONS COMPANY
YOUNGSTOWN, OHIO

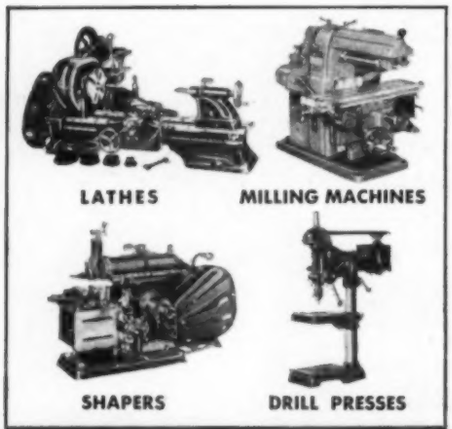
MANUFACTURERS OF A COMPLETE LINE OF COLD FINISHED CARBON AND ALLOY STEEL BARS

Licensor
MONARCH STEEL COMPANY
HAMMOND · INDIANAPOLIS · CHICAGO
PECKOVER'S LTD. Toronto, Canadian Distributor

ACTUAL PHOTOGRAPH
Speed Case Steel (.20 carbon) 1 inch cold drawn bar tied in a knot, cold, without fracture.



BUILT TO MAKE MONEY FOR YOU



Atlas
4 TOOL TEAM

Most shaping operations in shop or tool room are within the 7" stroke of an Atlas shaper. That is why its compact size is such an advantage. It saves on set-up time, saves on machine hour cost, saves on power. Savings that quickly translate into profits.

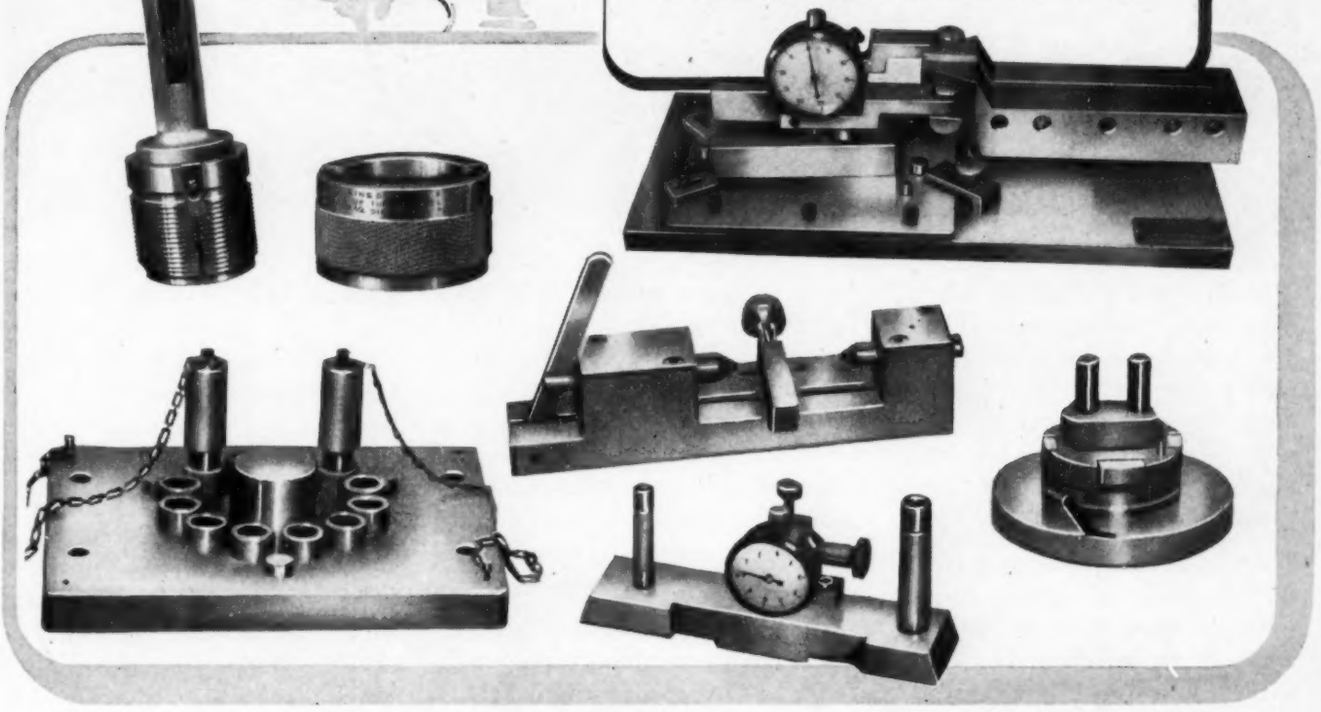
The Atlas shaper handles close tolerance work to perfection. Gives you a selection of cutting strokes between 45 and 186 per minute, speeds from 3½ to 116 fpm. It is Timken bearing equipped. Operates from ½ HP motor.

Send for catalog with complete specifications and operating details.

ATLAS PRESS COMPANY
704 N. PITCHER STREET, KALAMAZOO 13, MICH.

looking for ?

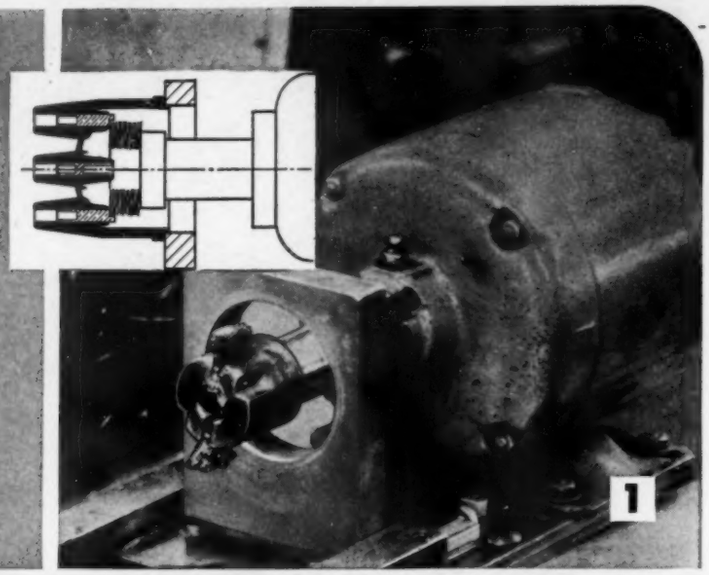
. . . *SPECIAL GAGES* or tools, fixtures and parts built to closest precision limits? Lincoln Park has a department devoted exclusively to special work. Here are combined the experience of skilled gage makers and the facilities of one of the country's finest gage plants. We'll be glad to supply full details as to the type of work that can be produced here for you.

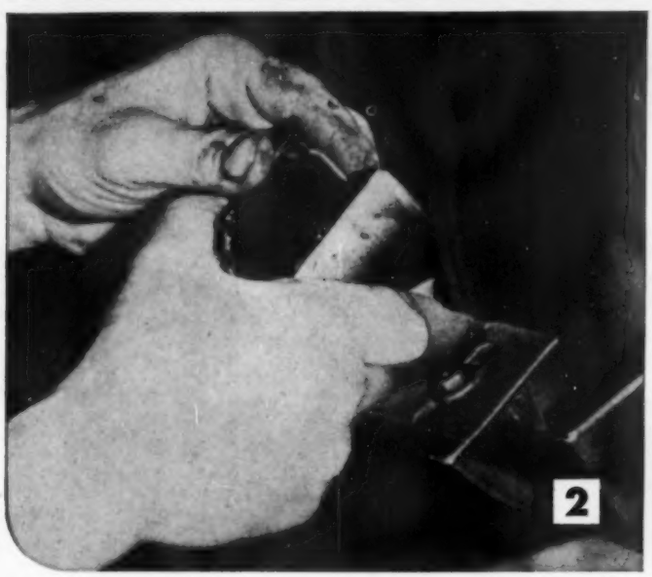


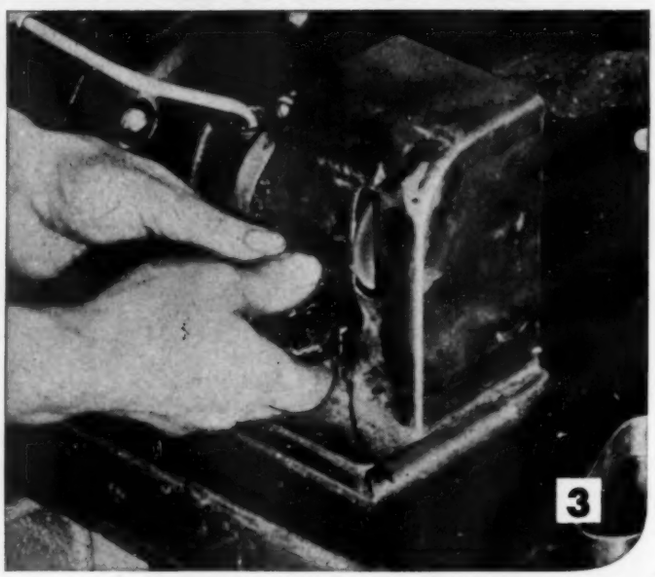
Lincoln Park INDUSTRIES, INC.

1723 FERRIS AVENUE • DETROIT 25, MICHIGAN

Brush away those *Small Job Headaches!*







EVERY plant has them—tedious, time-consuming jobs involving the cleaning and finishing of small parts and assemblies. Little jobs individually, but collectively costly operations that have an important bearing on the price tag of the finished product.

Scores of companies have adopted brushing as a solution to these small job headaches. A typical example is the West Pullman Works of the International Harvester Company, Chicago, which is devoted to small parts production for their wide line of farm equipment. Illustration No. 1 shows a special holder fitted with Osborn Situft brushes which removes burrs from terminal inserts inside tractor motor distributor caps. These inserts are almost impossible to reach by hand yet the job takes only seconds by brushing.

Removing varnish from magneto rotors and smoothing sharp edges with an Osborn brushing wheel is pictured in Illustration No. 2. And the little 2-inch Osborn brush shown in Illustration No. 3 cleans the secondary leadout of magneto coils.

Yes, they are little jobs but the savings made possible by brushing bulk up big on the cost sheet. Why not find out now where brushing can brighten your production picture? An Osborn sales engineer will gladly assist you in this analysis. Just say the word—soon.

Osborn Brushes

THE OSBORN MANUFACTURING COMPANY

5401 Hamilton Avenue *Cleveland, Ohio*

WORLD'S LARGEST MANUFACTURER OF BRUSHES FOR INDUSTRY

REPORT № 3

. . . ON TANTUNG* (PERFORMANCE)

BRANCH OFFICE CORRESPONDENCE

TO

FROM

DATE: 1947
BRANCH OFFICE: Phila., Pa.
FILE: Milling Cutter Blades
REFERENCE: Upon request

PRODUCT: Tantung
DEPARTMENT: Advertising
COPIES TO: Research
Engineering Sales

Here's a little story about Tantung I think you will like!

Manufacturers of a nationally known PRESS were milling close grained cast iron pedestals on an old milling machine using 18" cutters. Specifications called for two sides to be parallel and square, shoulders held at 90° to the sides and all machined surfaces to have a fine finish.

The difficult part of the job was—the machine spindle didn't run "true", and the shape of the pedestal, was such, that the cutter had to extend 18" from the spindle face. In using high speed steel cutter blades at slow speeds, runout in the spindle bearing made it impossible to obtain the true 90° surface required. This resulted in taking the piece off the milling machine and finishing the operation on a planer —a minimum of five hours of additional work.

The age of the machine and the slow speeds prohibited the economical use of carbide therefore TANTUNG was suggested AND IT DID THE JOB RIGHT!

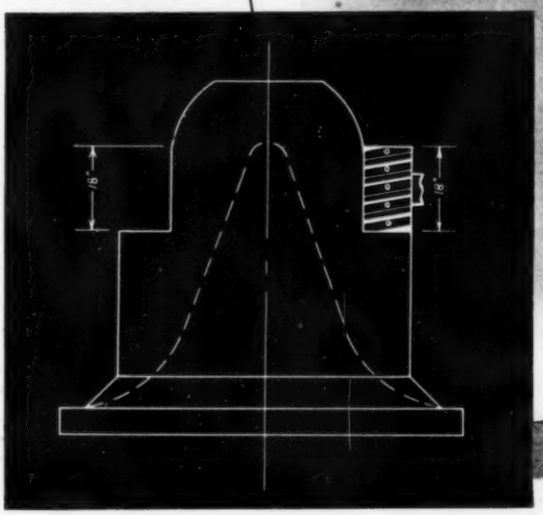
The increased speed possible with Tantung cutter blades, was sufficient to eliminate the runout of the spindle bearing, sides were held absolutely parallel, shoulders held at a perfect 90° angle and the finish was excellent.

In addition to abolishing the planer operation, greatly increased production resulted because TANTUNG cutter blades ran a full shift without regrinding.

P.S. I went away feeling proud of Tantung.

EH: eh

Just one of the 3 MILLION Tantung tool applications.



For additional information on Tantung tools and their applications write your nearest Vascoloy-Ramet Field Engineering Office or direct inquiries to the main Office.

MAKERS OF WORLD'S FINEST VR Carbides

*Reg. U. S. Pat. Off.

VASCOLOY-RAMET CORPORATION NORTH CHICAGO ILLINOIS

District Sales and Service in Principal Cities

An affiliate of The Fansteel Metallurgical Corporation and The Vanadium Alloys Steel Company

Exact precision alignment is secured with sleeve bearings more readily than with any other type. Bunting Cast Bronze Bearings pressed into the housing and bored in line assure the utmost in precision alignment. When alignment is one of your problems utilize this outstanding advantage and consult the Bunting Engineers whose experience is at your disposal. The Bunting Brass & Bronze Company, Toledo 9, Ohio. Branches in Principal Cities.
BUSHINGS
PRECISION BRONZE BARS
BRONZE BEARINGS
Bunting

"Save us 16 man-hours a day..." says PENN ELECTRIC SWITCH CO.

From report of James O. Peck Co. independent investigators... part of the continuing study of assembly savings made with Phillips Screws in leading plants.

Two girls drive 8000 screws a day each on a contact block assembly (above left). One, using Phillips Screws, can assemble parts and drive the screws. The other, using slotted screws, can perform only the driving operation.

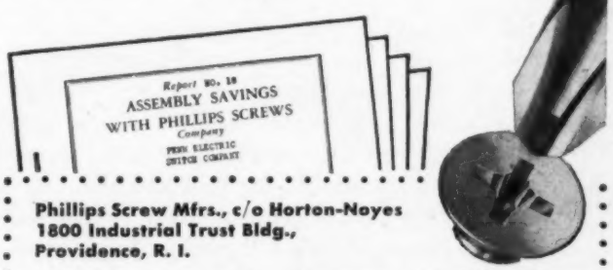
● "On our conveyor line assembly operation, the Phillips Recessed Head Screw is definitely a big time saver. We drive 30,000 screws a day, assembling 2000 water system pump switches," said the Methods Engineer.

"Use Of Phillips Screws Saves At Least 16 Man-Hours a Day. When you're driving 30,000 screws, even a small time saving per screw mounts up. A very conservative estimate of the time we save is 16 man-hours per day.

"Phillips Screws Gain Time For Extra Operations. A girl, driving as many Phillips Screws as another operator on slotted screws, can assemble parts also.

"Easier For The Bit To Find The Phillips Recess, whether we're using air drivers, hopper-feed power drivers, or ratchet drivers. On slotted screws, even with a screw finder, the driver spins several times before it finds the slot, and in many spots there isn't room to use a finder. Phillips Screws make driving anywhere faster, easier.

Write For Full Report of this and other assembly studies, covering metal, plastics and wood products. Do it NOW ... the coupon makes it easy.



PHILLIPS *Recessed Head* SCREWS

Wood Screws • Machine Screws • Self-tapping Screws • Stove Bolts

American Screw Co.
Central Screw Co.
Continental Screw Co.
Corbin Screw Div. of American Hdwe. Corp.
Elco Tool & Screw Corp.
The H. M. Harper Co.
International Screw Co.
Lamson & Sessions Co.
Milford Rivet and Machine Co.
National Lock Co.

24 SOURCES

National Screw & Mfg. Co.
New England Screw Co.
Parker-Kalon Corporation
Pawtucket Screw Co.
Pheoll Manufacturing Co.
Reading Screw Co.
Russell Burdsall & Ward Bolt & Nut Co.
Scovill Manufacturing Co.
Shakeproof Inc.
The Southington Hardware Mfg. Co.
The Steel Company of Canada, Ltd.
Sterling Bolt Co.
Stronghold Screw Products, Inc.
Wolverine Bolt Company

Phillips Screw Mfrs., c/o Horton-Noyes
1800 Industrial Trust Bldg.,
Providence, R. I.

Send me reports on Assembly Savings with Phillips Screws.

Name .....

Company .....

Address ..... A.M. 19

Waldes TRUARC retaining rings

2 MINUTES vs. 2 SECONDS!

This skilled assembler is using a screwdriver and six screws to install a collar. Each of the many light streaks indicate another time-consuming arm-motion, with less efficiency and greater fatigue.

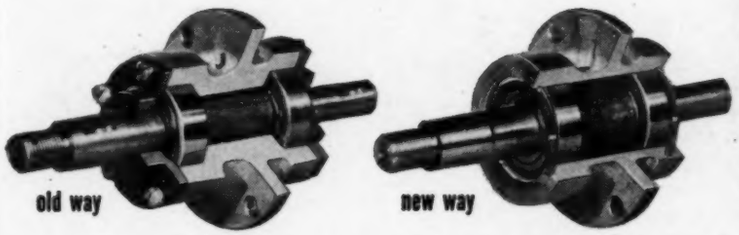
Same unit, same worker. But a simple redesign has substituted a Truarc ring for the collar and screws. He uses one tool—a pair of Truarc pliers. A single light streak means fewer arm-motions.

Right before your eyes is visual proof of how much assembly time can be cut. It's done simply by replacing conventional fastening devices with Waldes Truarc Retaining Rings. Less time is required for job-training, because Truarc guarantees accurate relationship of parts independent of the skill of the assembler. Inspection is simplified, rejections reduced—and the product will function longer without repair.

This new fastening does wonders for machine design. Truarc rings mean lighter weight, less bulk, maintenance of tolerances. Production and maintenance men find Truarc cuts labor and material costs wherever used. Its unique taper design assures constant circularity. Its never-failing grip assures a better job of holding machine parts together. Yet Truarc rings are easily removed and re-installed in a few seconds.

slash assembly time, cut costs

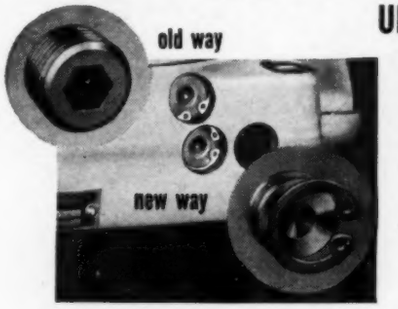
Typical cost-cutting applications:



TRUARC TRIMS 13 MINUTES' MACHINING TO 6

Permits redesign of exhaust-fan bearing-housing for M. & E. Manufacturing Company, Indianapolis. Truarc cuts assembly time 66%, trims 25% off weight of unit, lowers labor and material costs.

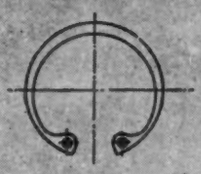
TRUARC ELIMINATES 12 OPERATIONS, CUTS UNIT COST 65 CENTS



Changeover to Truarc in hydraulic Powerpak cuts assembly time over 50% for Electrol, Inc., Kingston, N. Y. Permits use of semi-skilled assemblers, cuts maintenance time more than half.

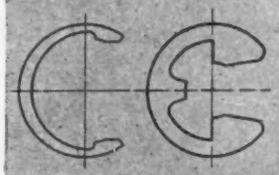
Your designs can easily be adapted to secure Truarc's advantages. See what can be done for your product: send your drawing to Waldes Truarc Technical Service Engineers for individual attention, without obligation.

THERE ARE DIFFERENT TRUARC RINGS FOR ANY APPLICATION:



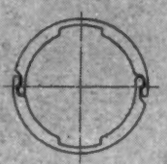
STANDARD.* Replaces bulky, complicated devices; simplifies assembly.

BEVELED* and **BOWED.*** Absorb end-play rigidly or resiliently where tolerances accumulate.



CRESCENT and **E-RING.** Snap on radially where axial assembly is impossible. Give firm grip.

SELF-LOCKING.* Economical where thrust is moderate — housing requires no machining.

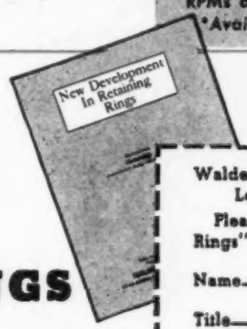


INTERLOCKING. 2-piece ring for heavy thrusts, positive lock against high RPMs and vibration.

INVERTED.* Uniform shoulder for abutting curves, for bearings with large corner radii.

**Available for both external and internal applications.*

WALDES
TRUARC
Reg. U. S. Pat. Off.
RETAINING RINGS



WALDES KOHINOOR, INC., LONG ISLAND CITY 1, NEW YORK
Canadian Distrib.: Controlite Engineering & Sales Ltd., 20 Bloor Street W., Toronto 5

[WALDES TRUARC RETAINING RINGS ARE PROTECTED BY U. S. PATS. 2,302,940; 2,026,454; 2,418,883 AND OTHER PATS. PEND.

• *Mail this coupon today for your copy of "New Development in Retaining Rings."*

Waldes Kohinoor, Inc., 47-10 Austel Place 12-Q
Long Island City 1, N. Y.

Please send booklet, "New Development In Retaining Rings" to:

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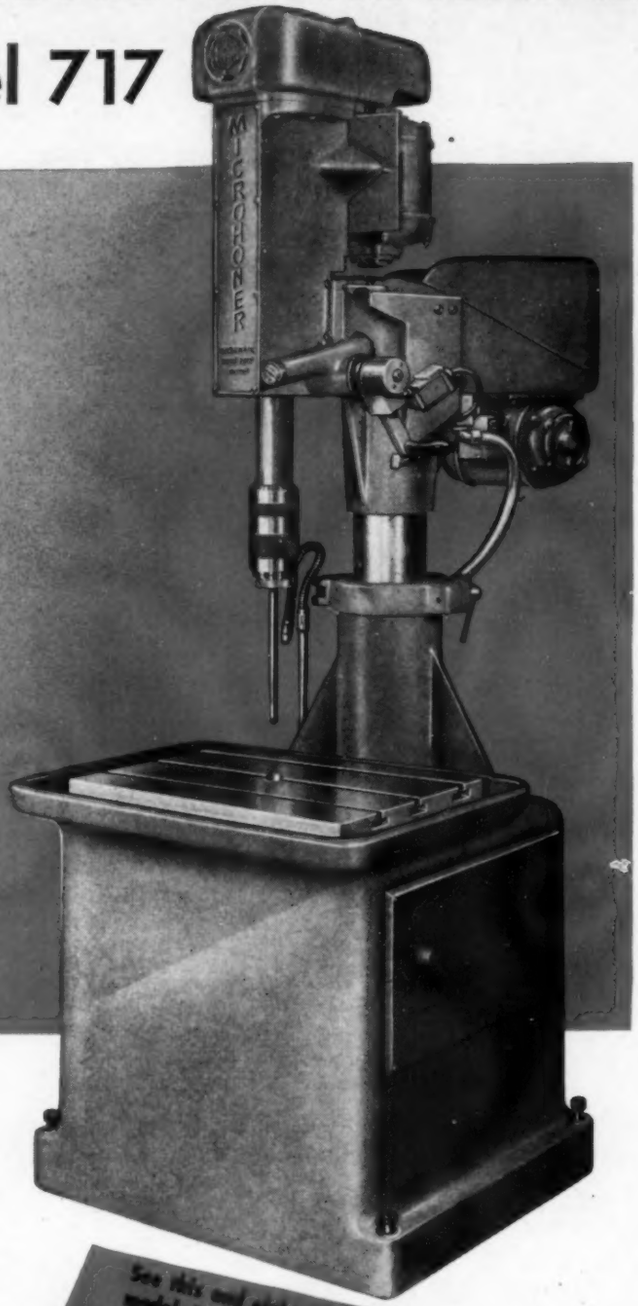
MICROMATIC

New MECHANICAL MICROHONER MACHINE

Model 717



THE full benefits of Microhoning accomplishment for salvage, tool room and semi-production work are provided in this new all-mechanically actuated machine. It is designed to Microhone to desired standards a wide variety of types and sizes of bores from ½ to 4-in. in diameter up to 7-in. maximum lengths, with a minimum number of tools and fixtures.

It is small and compact, but sturdily built. The table is integral with the cast iron base; the head is adjustably supported on a round, rigid column providing accurate alignment.

Full working usefulness of the adjustable, positive stroke is assured by an extra manual lift-out stroke. Cost of tooling is minimized, and complete operator control of tool expansion is possible because the adjusting head is mounted on, but does not rotate with the spindle.

Adaptability to parts of any material or type within the size range is assured by selection from six rotation and four reciprocation speeds.

Standard electrical equipment is located for quick service and maintenance accessibility.

Specifications

- For bore diameters . . . . . ½ to 4-in.
- For bore lengths . . . . . Up to 7-in.
- Stroke . . . . . 6-in.
- Liftout . . . . . 3½-in.
- Spindle to table, max. . . . . 24 11/16-in.
- Spindle to table, min. . . . . 7-in.
- Spindle to column . . . . . 11-in.
- Rotation speeds, r.p.m.
  1058-742-505-334-234-159.
- Spindle reciprocations per min.
  278-139-93-69.

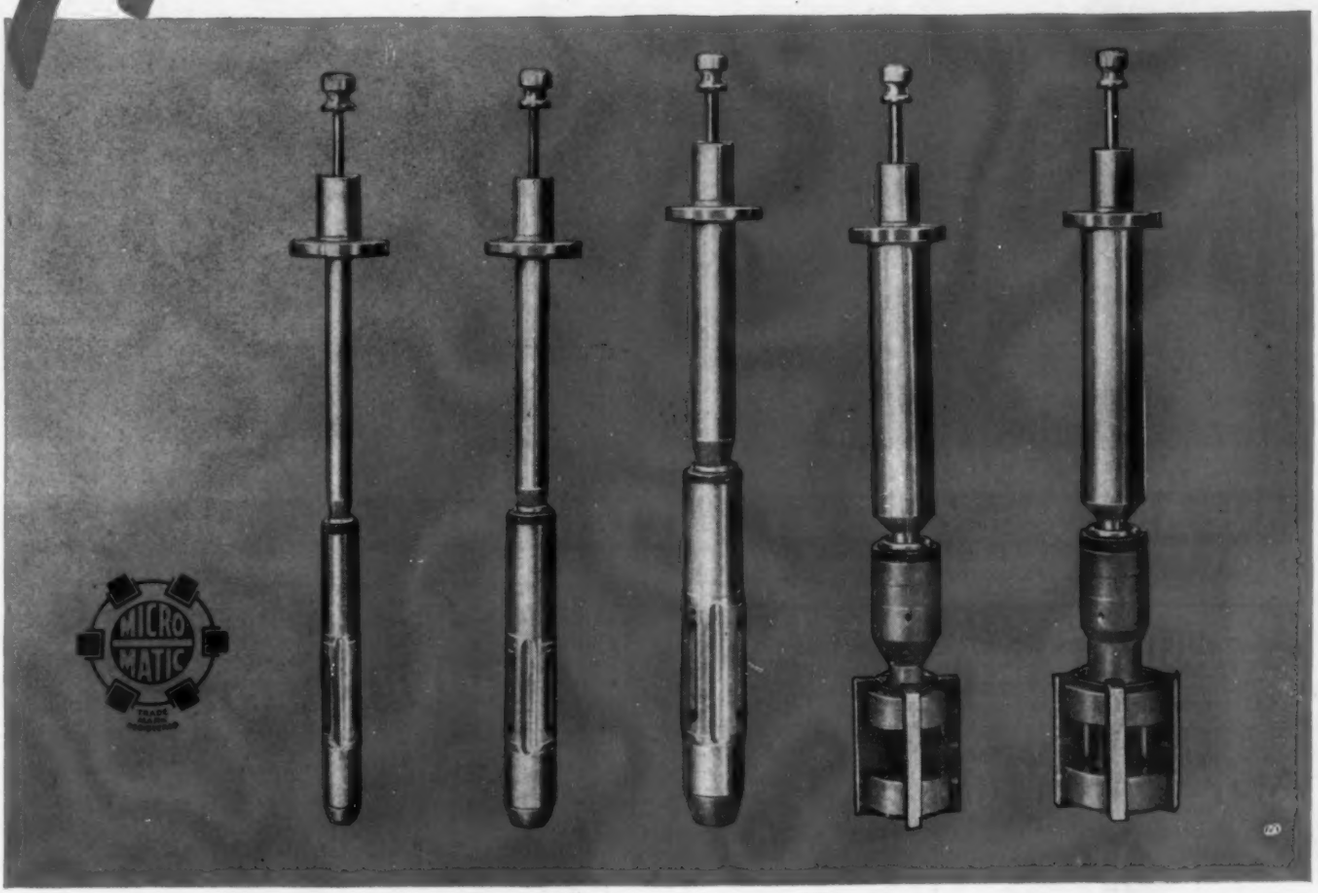
See this and eight other new models Microhoning machines at National Machine Tool Builders' Show, Chicago, September 17-26, 1947.

BOOTH 323

Microhoning Machines, Microhoning Tools, Microhoning Fixtures, and Microhoning Abrasives **MICROMATIC**

DISTRICT FIELD OFFICES: 1323 S. Santa Fe, Los Angeles 21, California. Phone: Tucker 3756
194 Dalhousie St., Brantford, Ontario, Canada. Phone: Brantford 1128 • 616 Empire Bldg., 206

New MICROMATIC MICROMOLD* UTILITY TOOLS



To extend the usefulness of Microhoning to short run and odd lot production use, a set of five tools is now available which, with some extra sets of stone-holder assemblies, cover the range from 1-in. to 4-in. diameter work. They provide all the expansion and operating controls of former general service type tools, with some added improvements for more economical operation in general purpose use.

They use newly developed Micromold abrasive assemblies, in which the abrasive sticks are mounted in plastic, molded in graduated heights and shaped to simulate the conventional production tool stone and stoneholder assemblies. This reduces the number of wearing parts in the tool, and makes it easy to change the Micromold assemblies for any change in bore size being Microhoned.

Other standard Micromatic Micromold tools can be provided for smaller or larger diameters, or to meet special conditions in blind end, interrupted or very short bores.

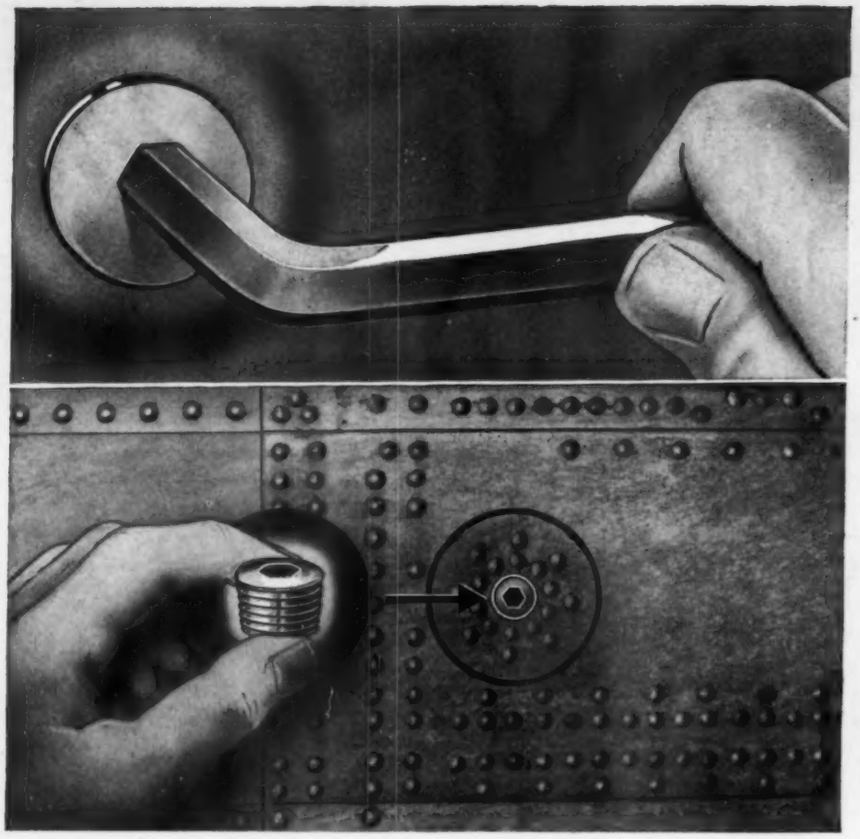
Specifications

Diameter	Lengths	Micromold Sticks: Sets	Stones set	Length
1″ to 1¼″	2″ to 6½″	2	4	1¾″
1¼″ to 1⅝″	2″ to 6½″	3	4	1¾″
1⅝″ to 2″	2½″ to 6½″	3	4	2¼″
2″ to 2¾″	3″ to 7½″	4	4	3″
2¾″ to 4″	3″ to 7½″	5	5	3″

*REG. U.S. PAT. OFF.

HONE CORPORATION 8100 SCHOOLCRAFT AVENUE DETROIT 4, MICHIGAN

So. Main St., Rockford, Ill. Phone: Forest 1128 • 927A—M & M Bldg., P. O. Box 981, Houston 2, Texas. Phone: Preston 2381 • Room 514—129 Church St., New Haven 10, Conn. Phone: New Haven 7-0035



ALLEN

HEX-SOCKET

PIPE PLUGS

From crankcases to sea-wings, in oil lines and hydraulic fluid lines, these plugs prevent leakage where safety depends upon it. The extra Allen HOLDING-POWER prevents loosening under vibration.

Cold-drawn of special-analysis *ALLENOY* steel (standard); also available in duralumin, bronze, brass, stainless steel and other metals. Lead screw threaded to close tolerances; scientifically heat-treated for *balanced* hardness and toughness. Here are all the strong-points of Allen Hex-Socket Screws, — for the perfect seal at drain points.

Order of your local Industrial Distributor

The Allen Mfg. Company ★ ALLEN ★ Hartford 1, Conn., U.S.A.

Alloy Steel Service From Seven Warehouses!

AISI HY-TEN SAE

ALLOY STEELS

Cutting to length, Heat treating, Forging. Testing, Turning, Special Finishes. Prompt shipment of rounds, squares, flats, hexagons, octagons, and billets. Technical information and recommendations.

Write for our data sheet book.

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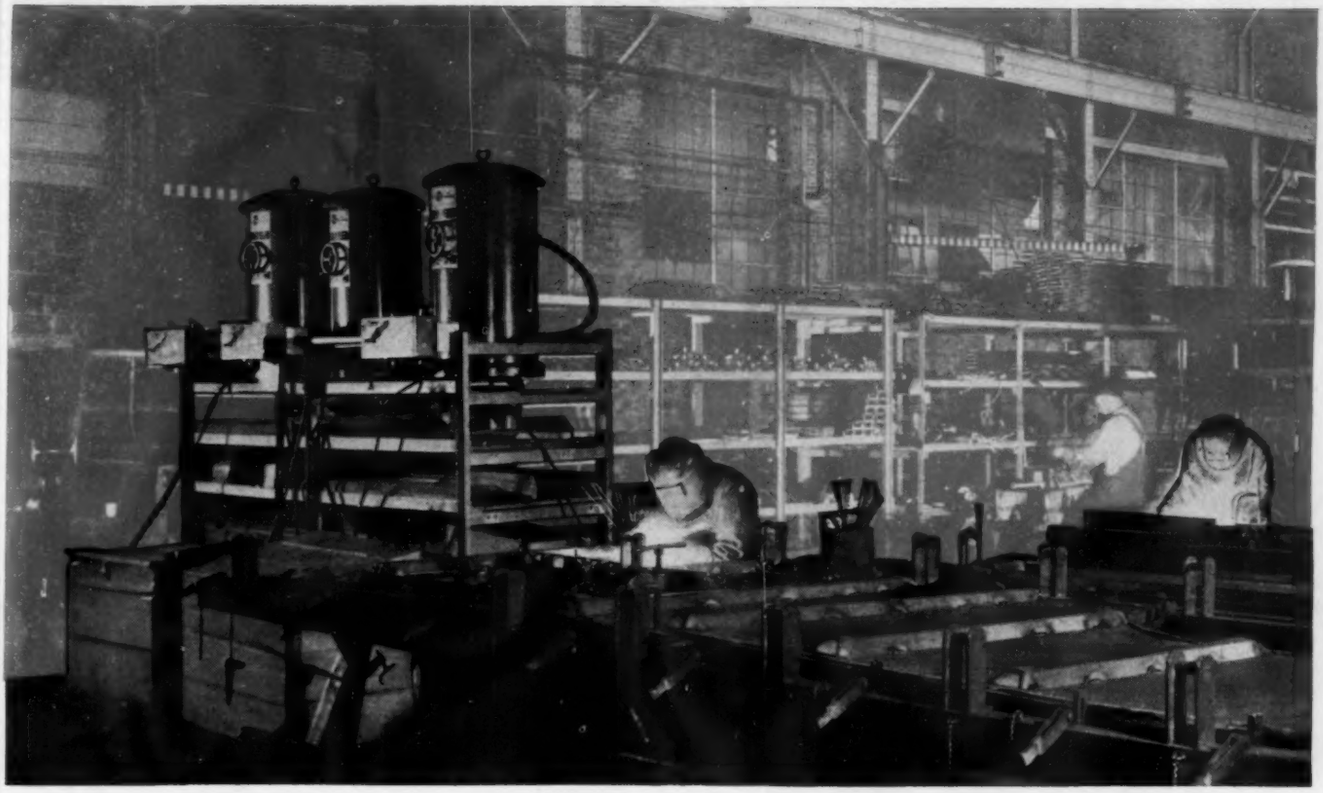
TUTHILL V-BELT UNITS

...The Economical Way to Handle Heavy Oils

To make light work of handling heavy oils, specify Tuthill V-belt pumping units. These compact, quiet, economical pumps are built for long dependable service with negligible maintenance. Features include internal gear rotary pumps, outboard ball-bearing shaft support, belt tension adjustment by one set screw and a wide range of speeds, capacities and pressures. Write for viscous liquid pump bulletin.

TUTHILL PUMP COMPANY

939 East 95th Street • Chicago 19, Illinois



SMITHway A. C. WELDERS cover every welding range

The complete line of SMITHway A. C. Welders includes general-purpose models rated at 150, 200, and 250 amperes and heavy-duty models rated at 300, 400, and 500 amperes.

A single convenient hand wheel controls welding current continuously over a wide range, makes desired selection simple, quick, accurate. Sturdy, welded frames assure long, trouble-free service. Heavy-duty coils maintain safe operating temperatures. Insulation is fireproof Fiberglas.

SMITHway Welders eliminate "arc blow." They permit the use of higher currents and larger electrodes. Difficult welds are made faster, easier, and better. Power costs are cut to a minimum. Practically no maintenance is required.

Weatherproof cases of SMITHway Heavy-Duty Welders assure dependable outdoor service in all kinds of weather. Write for complete specifications and prices on SMITHway A. C. Welders, Welding Monitors, and SMITHway *Certified* Welding Electrodes.

SMITHway Certified ELECTRODES

Proved in production, they give you better welds at lower welding costs. For all kinds of jobs in all kinds of shops. SMITHway Electrodes are

Made by Welders . . . for Welders

SMITHway Farm Welder

On-the-spot maintenance and repair—anywhere 230-volt A. C. power is available. Rated at 50 to 180 amperes. Weighs only 240 lbs. Rugged, simple to use, safe.

A.O. SMITH way mill

A. O. SMITH Corporation

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DOUGLAS LEIGH SKY SPECTACULARS

flash their messages with the help of

OHIO SPEED REDUCERS

Outstanding in outdoor electric display advertising is the Douglas Leigh Advertising Corporation. The Company's creations are known everywhere for their daring originality and compelling attraction.

The Company's latest development is the large fleet of dirigibles which nightly range the Eastern seaboard. On the sides of these airships are banks of lights which, by means of an ingenious electrical arrangement, can be made to flash trademarks, slogans and advertising messages. An endless tape, properly marked, moves through the machine, creating the contacts which spell out the word formations. An electric motor operates the device and the motor speed is reduced to readable timing through an Ohio Gear Speed Reducer.

Back of this development, however, lie months of careful engineering. Each part had to undergo rigid tests to determine its fitness in the complete operation. We are quite proud that the drive selected was an Ohio Gear Speed Reducer.

Whether you design, manufacture or maintain machines it will pay you to get all the facts on Ohio Gears and Speed Reducers.

THE OHIO GEAR COMPANY
1326 EAST 179th STREET • CLEVELAND 10, OHIO

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J. W. Minder Chain & Gear Co.
927 Santa Fe Avenue

LOUISVILLE, KY.
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Stocks carried.

OHIO GEARS

STANDARD ENGINEERS NOTEBOOK

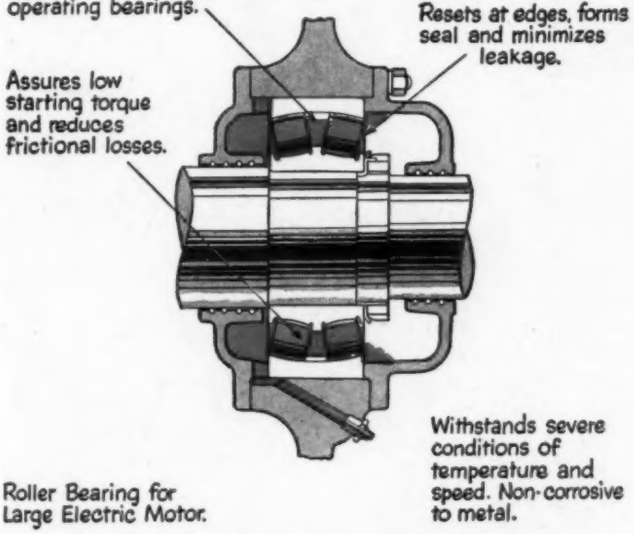
Anti-friction-bearing grease cuts frictional loss

Ball, and roller bearings in severe conditions of speed and temperature will start easier and operate with minimum running friction if they are lubricated with Calol Grease BRB-340.

This special grease is soft, smooth and has a fibrous texture. At high shear rates, it softens around balls or rollers to give complete coverage of all moving parts. However, because of its peculiar resetting ability, grease swept aside by balls or rollers stays hard enough to form a leak-preventing seal.

Calol Grease BRB-340 contains an unusual amount of high-quality oil stock which provides outstanding lubrication. Bleeding of this high oil content is eliminated by a special milling process.

In a bearing operating 10,000 rpm at 200°F. for 528 hours, Calol Grease BRB-340 showed no separation. The bearing was in good condition at the end of the test.

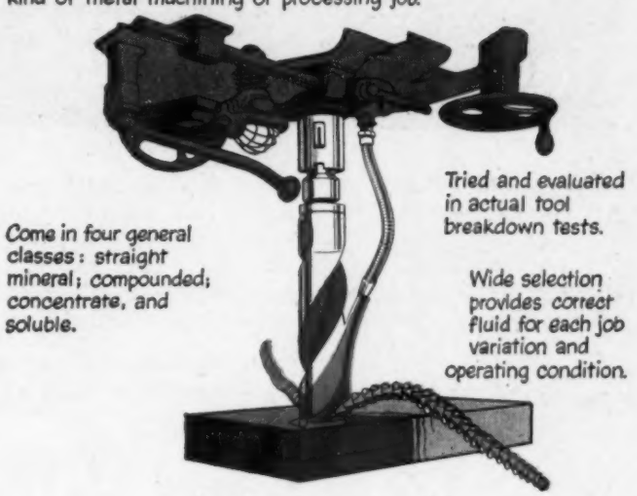

Calol Grease BRB-340 softens to proper consistency in operating bearings.
Resets at edges, forms seal and minimizes leakage.
Assures low starting torque and reduces frictional losses.
Withstands severe conditions of temperature and speed. Non-corrosive to metal.

Roller Bearing for Large Electric Motor.

This drawing prepared with cooperation of SKF Industries, Inc.

Trademark "Calol," Reg. U. S. Pat. Off.

There are Calol Cutting Fluids for every kind of metal machining or processing job.


Come in four general classes: straight mineral; compounded; concentrate, and soluble.
Tried and evaluated in actual tool breakdown tests.
Wide selection provides correct fluid for each job variation and operating condition.

Multiple-Speed Radial Drill.

This drawing prepared with cooperation of The American Tool Works Co.

Calol Cutting Fluids meet all metal-working needs

To meet all variables in cutting and forming metals, Standard of California has developed a complete line of Calol Cutting Fluids. There are four general classes: Straight mineral oils for light operations and for blending with concentrate; ready-mixed compounded oils of both dark and transparent types; concentrate which can be used either straight or diluted, and soluble oils for mixing with water. The compounded oils include lard, sulphurized and chlorinated types.

This wide selection makes it easy to get a ready-mixed Calol Cutting Fluid or mix one that exactly meets the special requirements of each individual operation, thus obtaining higher work efficiency.

To make sure each ready-mixed Calol Cutting Fluid will do the work for which it is recommended in the best possible manner, it is evaluated in a special "breakdown" test.

For additional information and the name of your nearest Distributor, write Standard of California, 225 Bush Street, San Francisco 20, Calif.; The California Oil Company, 30 Rockefeller Plaza, New York 20, N. Y.; The California Company, 17th and Stout Streets, Denver 1, Colo.; Standard Oil Company of Texas, El Paso, Texas.

FOR EVERY NEED A STANDARD OF CALIFORNIA JOB-PROVED PRODUCT

The *SIDE* of a V-BELT

is the *ONLY* Part that *Even Touches* the Pulley

Naturally, it *GETS* the *WEAR!*

Diagram of V-Belt in Sheave Groove

The moment you look at a V-belt in its sheave, you see that the *sides* are the only part that ever *touch* the pulley. The *sides* do all the *gripping*—they get *all the wear* against the sheave groove wall. The sides *pick up* the load. They transmit that load to the belt as a whole. And then, once more, the sides—and the sides alone—take hold of the driven pulley and deliver the power to it.

No wonder you have always noticed that the sidewall of the *ordinary* V-Belt is the part that *wears out first.*

Now See How the *Patented* CONCAVE SIDE *REDUCES Sidewall Wear— *Lengthens Belt Life!*

Clearly, since the sidewall is the part that wears out first, anything that prolongs the life of the sidewall will lengthen the life of the belt. The simple diagrams on the right show exactly why the ordinary, straight-sided V-Belt gets excessive wear along the *middle* of the sides. They show also why the Patented Concave Side greatly reduces sidewall wear in Gates Vulco Ropes. That is the simple reason why your Gates Vulco Ropes are giving you so much longer service than any straight-sided V-Belts can possibly give.

The CONCAVE SIDE Is a GATES PATENT

Straight Sided V-Belt

Fig. 1

How Straight Sided V-Belt Bulges When Bending Around Its Pulley

Fig. 1-A

You can actually feel the bulging of a straight-sided V-Belt by holding the sides between your finger and thumb and then bending the belt. Naturally, this bulging produces excessive wear along the middle of the sidewall as indicated by arrows.

Gates V-Belt with Patented Concave Sidewall

Fig. 2

Showing How Concave Side of Gates V-Belt Straightens to Make Perfect Fit in Sheave Groove When Belt Is Bending Over Pulley.

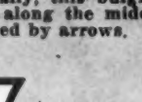


Fig. 2-A

No Bulging against the sides of the sheave groove means that sidewall wear is evenly distributed over the full width of the sidewall—and that means much longer life for the belt.

*More Important NOW That Gates SUPER V-Belts are Available

Now that Gates *SPECIALIZED* Research has resulted in Super V-Belts capable of carrying much heavier loads—up to 40% *higher horse-power ratings* in some cases—the sidewall of the belt is called upon to do even *more work* in transmitting these heavier loads to the pulley. Naturally, with heavier loading on the sidewall, the life-prolonging Concave Side is more important NOW than ever before!

THE GATES RUBBER COMPANY
DENVER, U. S. A.
"World's Largest Maker of V-Belts"

477

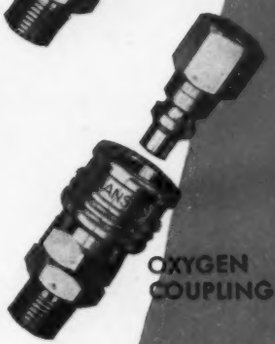
GATES VULCO ROPE DRIVES

Engineering Offices and Jobber Stocks **IN ALL INDUSTRIAL CENTERS** of the U. S. and 71 Foreign Countries

Gates
THE MARK OF SPECIALIZED RESEARCH

HANSEN *Couplings* Are Used On a VARIETY of JOBS

ACETYLENE COUPLING



OXYGEN COUPLING

AIR, OIL—GREASE COUPLING

EACH DAY a new use is found for Hansen couplings, proving their adaptability, versatility and right design. Hansen couplings have made their mark in many fields and their long list of accomplishments is growing longer each day.

There is a specific Hansen coupling made for air, oil, grease, oxygen, and acetylene, and they come in a wide range of standard sizes.

Hansen couplings are simple and easy to operate — merely push plug into socket, coupling is connected and locked — slide sleeve back with thumb, coupling is unlocked and disconnected. Hansen couplings are rugged, with all moving parts fully protected, consequently they will stand up under rough usage. Complete swivel action prevents kinking of hose. They can be readily incorporated in new or existing equipment.

Our representatives will be glad to discuss with your engineers the possibilities and many advantages of Hansen couplings. Send for illustrated catalog.

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Read what DI MACHINE says about FORMSPRAG

THE FULL COMPLEMENT
Over-Running Clutch

DI MACHINE
Automatic Punch Presses

2711 West Irving Park Road
CHICAGO 18, ILLINOIS

May 16, 1947

Formsprag Company
1415 Jarvis Street
Ferndale, Michigan

Gentlemen:

In an effort to increase the accuracy of the automatic feeding mechanism of the Diebel Hi-Speed Automatic Presses, our engineers have studied the many clutches available. You will be interested to learn that we have decided to employ the Formsprag Over-Running Clutch as a standard component of both our five and twelve ton punch presses.

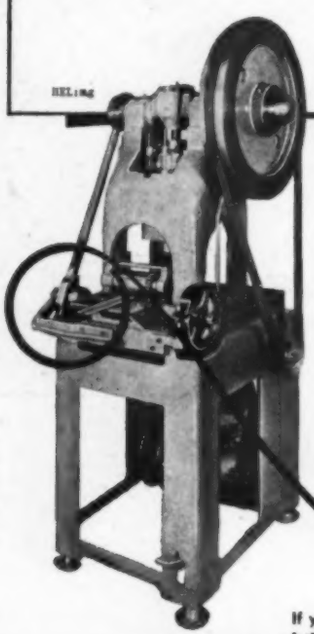
A roll feed, such as is a part of the Diebel Hi-Speed Automatic Presses, demands certain requirements of the clutch employed. First, the automatic roll feeding mechanism requires a highly accurate clutch. This is true especially if progressive dies are used in production. Second, backlash cannot be tolerated if accurate feeding is to be maintained. Third, because our five ton machine is adjustable up to 550 strokes per minute and our twelve ton machine up to 300 strokes per minute, the clutch must be capable of smooth and rapid operation.

Our decision to use your clutch was based on our conviction that the Formsprag Over-Running Clutch completely fulfills the exacting requirements created by our machines. We believe that your clutch assures the very greatest accuracy of feed, and backlash is eliminated. Furthermore, positive engagement and disengagement can be made hundreds of times per minute.

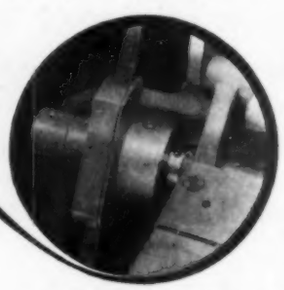
We are pleased to inform you that our opinion of your clutch has been substantiated by the efficient operation of the Diebel Hi-Speed Automatic Presses in actual production in the light stamping and forming field.

Very truly yours,
DI MACHINE CORPORATION
E. H. Larson
General Manager

HEL:mg



FORMSPRAG is *more* than an efficient, trouble free, over-running clutch. It is a feature that makes sales for the products using it. It proves to your customers that you are giving them a better, more efficient product.



If you have or may have an application, let's talk it over.

FORMSPRAG Company
1415 JARVIS • FERNDALE, MICH.

Fluidmotion® Radius and Angle Dressers save time in ACCURATE FORM DRESSING

"FLUIDMOTION", an exclusive J & S development, automatically blends any combination of angles and arcs in **one** continuous motion, with **one** setting, using **one** *handle*. Produces clean, precise form without tool or chatter marks. Available in models **C, E** and **F** . . . also the **Form Master**, an accurate lower priced dresser. Send for folder.

Fluidmotion FEATURES

- *automatic centering*
- *.0001" accuracy*
- *one setting per form*
- *14" wheel capacity*
- *large radius range*
- *dustproof*
- *chatterless*

®REG. U.S. PAT. OFF.

J&S TOOL CO.
479 Main Street, East Orange, N. J.

ZEROL GEARS
To Your Exact Specifications

For smoother, quieter operation wherever straight bevel gears are conventionally used

Write for Bulletin on Gear Jobbing Service
—Our Specialty for More Than 30 Years

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GEAR HEADQUARTERS

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GEAR WORKS INCORPORATED

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NEW YORK • PITTSBURGH • CHICAGO . . . IN CANADA: WILLIAM AND J. G. GREEY LIMITED, TORONTO

Industrial Gears and Speed Reducers
LimiTorque Valve Controls

IT'S JUST AS GOOD NOW

It's been a long time since January, 1909, when this ad announcing a new Earle plant first appeared on the front cover of American Machinist.

But, our original guarantee to "give you the kind of work you want" is just as good now as it was then.

It was with that guarantee that we first started supplying gears of all types and special machinery. It was because of that guarantee that we have enjoyed continuing success.

It's been good business to "give you the kind of work you want"—good business for us, and for you, our customers.

And it's on the basis of that guarantee that we continue to ask you to "write for estimates on your work."

EARLE GEARS

THE EARLE GEAR & MACHINE CO. • 4723 STENTON AVE., PHILA. 44, PA.

GEAR NOISE . . . DESTROYS

RUINS MORALE—SLOWS PRODUCTION —CUTS PROFITS

Silent G-E nonmetallic gears reduce destructive gear noise. Two types are available to benefit a wide variety of applications.

G-E FABROIL gears for heavy-duty applications consist of compressed cotton fibers held together by steel shrouds and threaded studs.

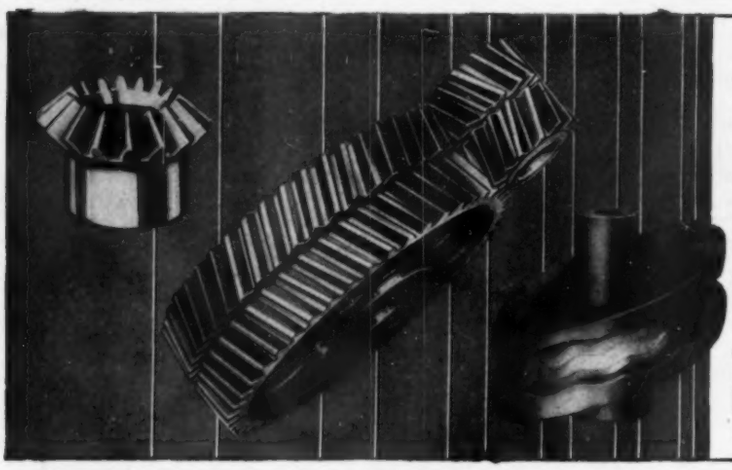
G-E TEXTOLITE gears for lighter jobs consist of numerous layers of woven fabric held in compression by a phenolic resin.

BOTH ARE STRONG—SILENT—RESILIENT

For complete information contact your gear cutter. For the bulletin, "Silent Gears", write to Section X-7, Plastics Division, Chemical Department, General Electric Company, One Plastics Avenue, Pittsfield, Mass.

GENERAL ELECTRIC

CD47-F3



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GEARS of every description cut to order

GEAR, CAM and THREAD grinding

AERONAUTICAL PARTS on contract basis

Send blue prints or samples for estimate. Accuracy of work guaranteed to your specifications.

THE HARTFORD SPECIAL MACHINERY COMPANY

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Better Gear Products

GANSCHOW

CUT GEARS AGMA ALL TYPES

GANSCHOW GEAR CO., 14 N. Morgan Street, CHICAGO 7.

Small Cam-Operated
DRUM SWITCHES

SIZE 00 - ¾ hp
SIZE 0 - 2 hp
SIZE 1 - 5 hp

for Multi-Speed Motor Control
Reversing Service
Master or Transfer Switching

An 8-page bulletin is required to describe the great variety of applications and switching combinations of these handy Bulletin 353 cam-operated drum switches. They can be built up to 15 sections, with contacts opening or closing at any point of lever travel. Switching problems can be solved with surprising ease and simplicity. The silver alloy contacts require no cleaning or servicing, because any oxide which may form on the contacts is as good a conductor as the contact metal, itself. There are no sliding contacts . . . the beryllium copper fingers operate with a quick-closing and quick-opening action. Available in three sizes shown above.

Sectional view of Bulletin 353 Drum Switch showing contact sections and central operating shaft with hand lever.

A-B Quality

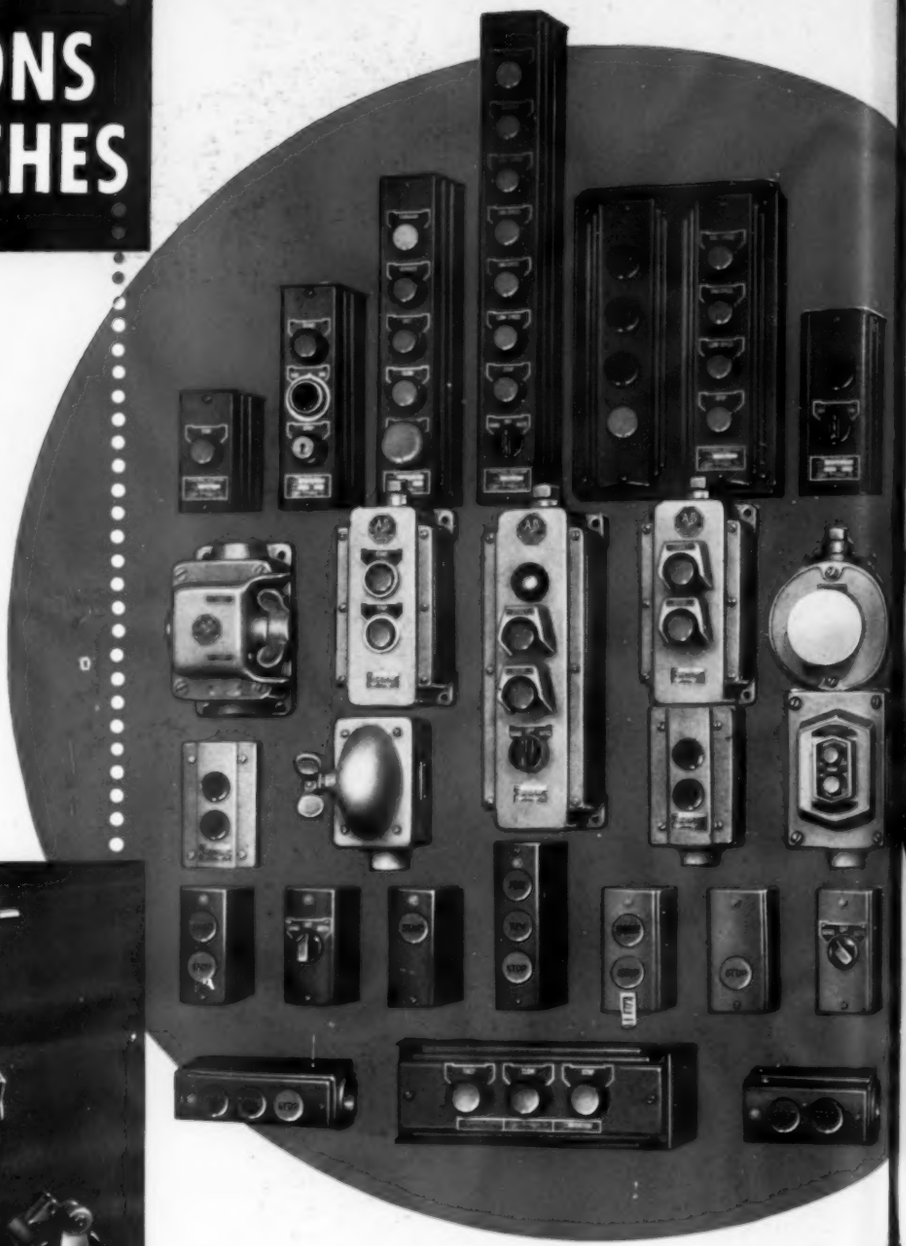
ALLEN-BRADLEY
Quality
MOTOR CONTROL

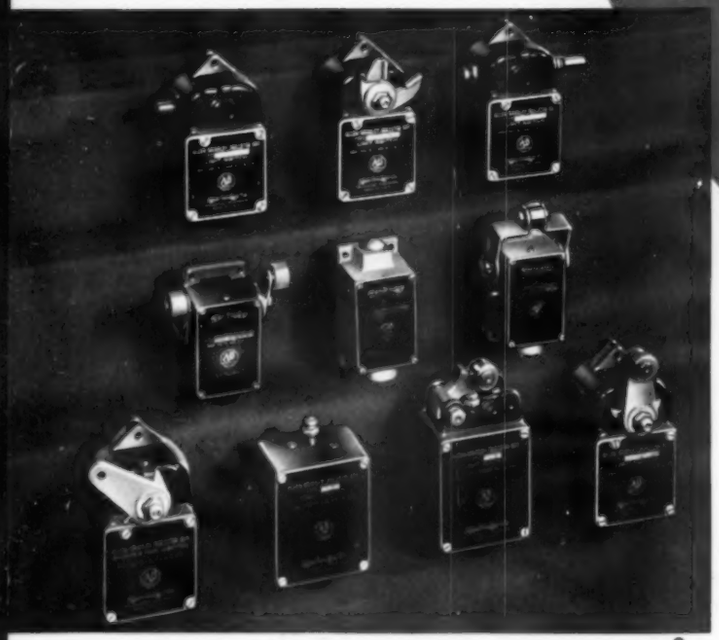
PUSH BUTTONS LIMIT SWITCHES

for

Manual and Automatic Control

If you are designing machines . . . or installing new machines . . . get the most out of them with push buttons or limit switches of the correct type. Added safety can be assured by using extra STOP buttons or perhaps a limit switch. Convenience, speed, and less spoilage are a few other advantages of adequate use of modern pilot control stations.





Limit switches are more than "stop-motion" units . . . they regulate machine speeds during bed travel or automatically put machines through a repeated sequence of operations. Send for Bulletin 801-802 on Allen-Bradley standard, heavy duty, and precision limit switches.

The above illustration shows 25 of the several hundred types of standard push button stations that are listed in Allen-Bradley Bulletin 800. But these few examples will serve to indicate the immense variety of enclosures, button labels, numbers of buttons, and also such auxiliary elements as pilot lights, selector switches, etc., which can be selected from the standard Allen-Bradley line to fit your needs. If you build or use motorized machines, by all means send for Bulletin 800, today.

Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis.

A-B Quality

ALLEN-BRADLEY

QUALITY

MOTOR CONTROL

Formal Announcement

OF A PROVED ACHIEVEMENT

CLEARING S SERIES PRESSES DOUBLE CRANK—WELDED STEEL

This Clearing series is new, but by no means untried. Clearing presses of S Series have been performing, in actual routine production, in different plants and in sufficient numbers to prove their merits beyond question.

Being crankshaft driven, these presses are naturally less costly than the eccentric presses for which Clearing is so well known. However, the welded steel construction—pioneered by Clearing years ago—the long, adjustable and removable gibs, the barrel-type slide adjustment, and other features mark the Clearing S Series, herewith formally announced, as something far beyond the ordinary crankshaft press. Capacities from 135 tons, bed widths from 42". Details are yours for the asking.

MECHANICAL AND HYDRAULIC PRESSES ★ 45 TONS CAPACITY AND LARGER

CLEARING

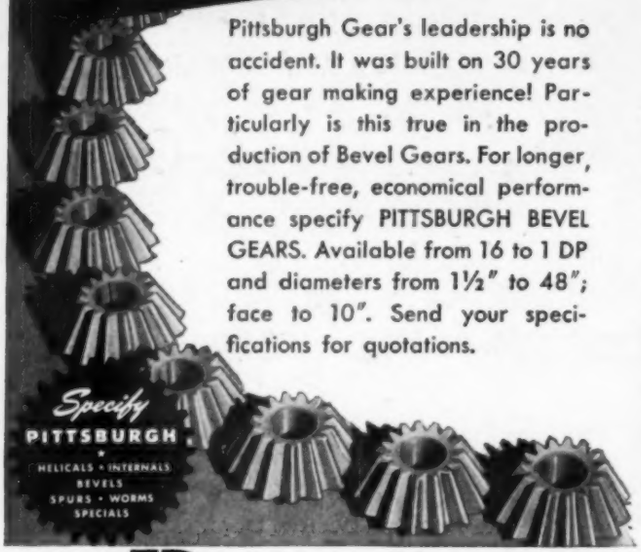
THE WAY TO EFFICIENT MASS PRODUCTION

CLEARING MACHINE CORPORATION

6499 WEST 65TH STREET • CHICAGO 38, ILLINOIS

PITTSBURGH
BEVEL GEARS

Pittsburgh Gear's leadership is no accident. It was built on 30 years of gear making experience! Particularly is this true in the production of Bevel Gears. For longer, trouble-free, economical performance specify PITTSBURGH BEVEL GEARS. Available from 16 to 1 DP and diameters from 1½" to 48"; face to 10". Send your specifications for quotations.



PITTSBURGH GEAR
AND MACHINE COMPANY | 27th & Smallman Streets PITTSBURGH 22, PA.

PIONEER PRODUCER OF QUALITY GEARS

CINCINNATI . . .
Spiral Bevel Gears
HAVE MUCH TO OFFER

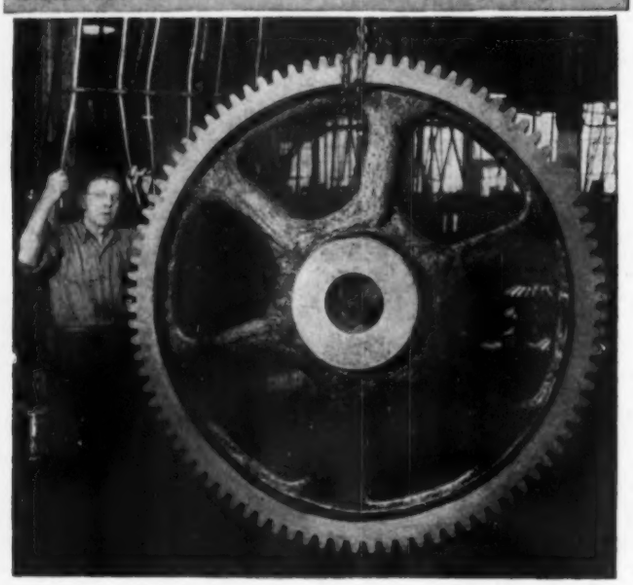
Maximum performance and dependability are two qualities that are absolutely essential in gears for any industrial purpose.

All Cincinnati Spiral Bevel Gears are cut, tested, matched, lapped and marked in individual sets . . . to insure correct bearing location on teeth.

For smooth, efficient operation at high speeds . . . specify Cincinnati Gears, *Good Gears Only!*

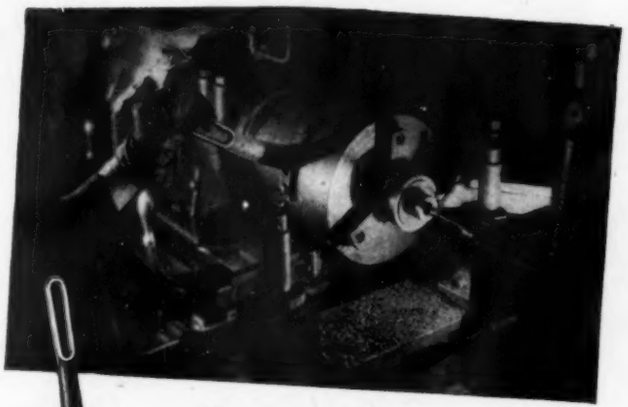
THE CINCINNATI GEAR COMPANY
"Gears . . . Good Gears Only"
Wooster Pike and Mariemont Ave. ★ Cincinnati 27, Ohio

READY—*for Shipment—for Operation*



Ready for operation in a job that will put it to the severest test of constant, heavy duty use, this Big Stahl gear is accurately cut and ready for delivery—on time! Producing gears like this—one or a hundred—for all types of heavy duty installations is a Stahl specialty. We have the equipment and the skill to produce your gears economically and promptly. For any type of gear, in any size or quantity, get a Stahl estimate first!

STAHL GEAR & MACHINE CO.
3901 Hamilton Ave., CLEVELAND 14, OHIO



If you want
MORE PARTS *per hour*
LOWER COST *per part*

the BARKER WRENCHLESS CHUCK can do it faster, better and stand up to it longer. Where the run is continuous on turrets, engine lathes, cutting off machines, drill presses or any other type of chucking machine, these Chucks will increase production and pay for themselves in 60 to 90 days while doing it. See how a Barker Wrenchless Two-Jaw or Three-Jaw Chuck can speed up production in YOUR plant.

Write for bulletin 201 today

Chuck Division
THOMAS HOIST CO.
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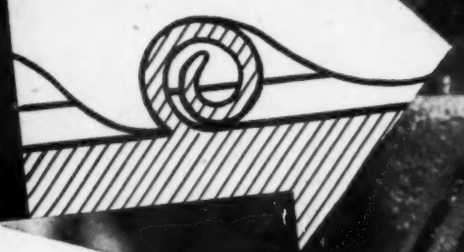
ATKINS *Curled Chip* MILLING SAWS

CHEAPER CHIPS

with a "lift-and-curl" cutting action



See what happens when Curled-Chip tooth hits tough metal

Because its tooth-form is scientifically right, Atkins New Curled-Chip Circular Milling Saw is reducing the cost of removing metal in plants everywhere. That inward-curved cutting face of the tooth *lifts* the chip with a smooth continuous curling action—no power is wasted *pushing* the chip against a vertical face. And the curled-up chip, like a tightly-coiled clock spring suddenly released, literally explodes from the gullet. There's no clogging, even with non-ferrous metals. There's no excessive heat generated by friction to break down the cutting edge. This means greatly increased cutting life. Check the case histories listed—they offer proof positive that Atkins Curled-Chip Circular Milling Saws permit faster, heavier feeds . . . reduce your downtime . . . save your dollars.

See your industrial distributor first.

READ WHAT HAPPENS
when curled-chip teeth go into action

- On electric steel, Atkins 6" Curled-Chip Milling Saw reduced time per cut from 7½ minutes to 10 seconds, increasing production 45 times.
- On a milling machine application, production was stepped up from 20 to 500 units per hour, yet accuracy within .002 tolerance still maintained, with Atkins Curled-Chip Milling Saw.
- On a job cutting tubular bearing shafts, Atkins Curled-Chip Milling Saws increased cutting rates from two to ten cuts per hour—ten times the previous rates.

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ATKINS

E. C. ATKINS AND COMPANY

Home Office and Factory: 402 S. Illinois St., Indianapolis 9, Ind.

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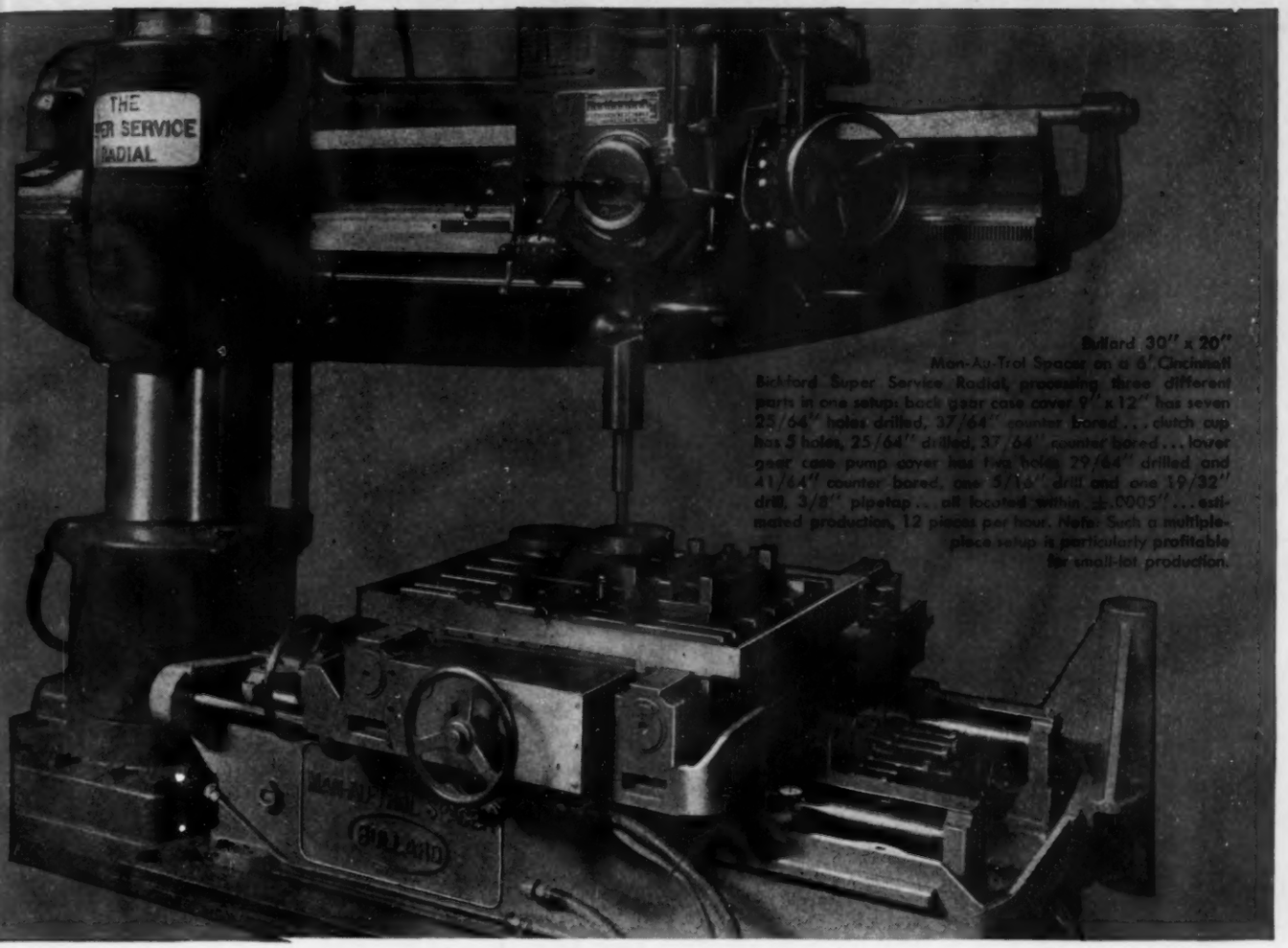
Makers of Better Saws for Every Cutting Job—Power and Hand Blades . . . Milling Saws . . . Segmental Cold Saws . . . Metal Cutting Bands

Bullard 4" x 4" Man-Au-Trol Spacer on a 24" Cincinnati Bickford Super Service Box Column Upright, processing motor coupling: four 5/8" holes, drilled, bored and reamed, 1" deep... accuracy ±.0005" instead of former method's ±.001"... production increased approximately 50%.



Bullard 30" x 20" Man-Au-Trol Spacer on a 6' Cincinnati Bickford Super Service Radial, processing three different parts in one setup: back gear case cover 9" x 12" has seven 25/64" holes drilled, 37/64" counter bored . . . clutch cup has 5 holes, 25/64" drilled, 37/64" counter bored . . . lower gear case pump cover has two holes 29/64" drilled and 41/64" counter bored, one 5/16" drill and one 19/32" drill, 3/8" pipetap . . . all located within ±.0005" . . . estimated production, 12 pieces per hour. Note: Such a multiple-piece setup is particularly profitable for small-lot production.

New Bullard Man-Au-Trol Spacers Eliminate Hole-Locating Jigs and Fixtures

Bullard MAN-AU-TROL Spacers now on the production line are more than living up to their advance notices. Machines and men formerly tied up on the non-productive work of making hole-locating jigs are now doing the kind of productive work that cuts operating overhead, develops competitive price advantages and steps up profit. Drilling, boring, reaming and tapping volume and accuracy are reaching new peaks . . . while operators' fatigue is measurably reduced.

To bring yourself up to date on this revolutionary new hole-locating method, write for the MAN-AU-TROL Spacer Bulletin. The Bullard Company, Bridgeport 2, Connecticut.

BULLARD

CREATES *NEW METHODS*

TO MAKE MACHINES DO MORE

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INDIVIDUAL ATTENTION

Whether your gear requirements involve standard cut-gears (which we have in stock), or special gears to be cut to your specifications, you can depend on GRANT to give you the kind of service which has resulted in a continuous growth of our business over a period of 64 years.

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BOSTON, MASS.

Here is a typical use of "ROCKWELL" Hardness Testers in modern manufacture

PRECISION TESTING on a PRODUCTION SCALE

In the West Hartford plant of Pratt & Whitney Division, Niles-Bement-Pond Co., "ROCKWELL" Hardness Testers are used to test aircraft engine parts. Although these tests are made by girls on a mass production scale, every test is as dependably accurate as if made in the laboratory by the Chief Metallurgist.

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AN ASSOCIATE COMPANY OF AMERICAN CHAIN & CABLE COMPANY, INC.
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- DAYTON ROGERS DIE CUSHIONS

No matter how you figure it Dayton Rogers Die Cushions will assure better results and lower production costs on your punch press operations because:

1. They are readily adapted to either short run quantity requirements or for large quantity production.
2. They automatically convert a press from single action to double action for deep drawing work.
3. Correct pressure pad control on forming dies obtained quickly by simply adjusting the pressure regulator.
4. They afford positive stripping action on all compound, blanking and piercing dies.

Write for illustrated, engineering catalog #100-1

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BAUMBACH *The* DIE SET AUTHORITY

All Baumbach Die Sets have demountable Leader Pins and Bushings. This exclusive feature permits removing Leader pins for machine work on the die shoe and assures reassembly without loss of alignment. A big time and trouble saver. Write for Catalog.

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Ettco-Emrick
TAPPING ATTACHMENTS

The professor is right. It's no trick at all to turn any drill press into a fast, accurate tapping machine with an Ettco-Emrick Attachment. Just slip the Attachment into the spindle and you're all set. It's the lowest-cost way to tool up for regular tapping production or extra tapping capacity. And the quality of tapping you get, will satisfy all commercial requirements.

BULLETIN No. 2 gives full details of the exclusive design and construction features that give Ettco-Emrick Tapping Attachments their hair-trigger sensitivity, accuracy and long service life. Write for a copy today.

ETTCO TOOL COMPANY

590 Johnson Avenue, Brooklyn 6, N. Y.

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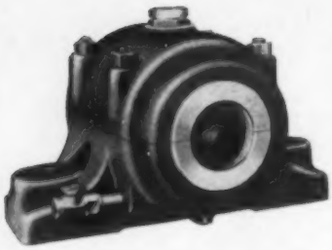

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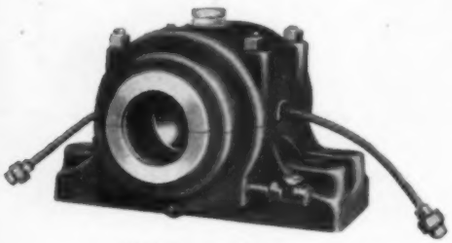
A precision-built, ring-oiling babbitted bearing, self-aligning and exceptionally quiet. Special seals prevent oil leakage and keep dirt out. Field-proved by thousands of installations.



WATER-COOLED SLEEVOIL PILLOW BLOCK

Designed for applications where higher temperatures are encountered. Shaft sizes from 1-11/16" to 8". Widely used under industry's toughest operating conditions.

DH BALL BEARING FAN AND BLOWER PILLOW BLOCK

Single row, deep groove ball bearings for No. 2 arrangement. Inner race extended to form sleeve which carries shaft. Piston ring seals retain lubricant, exclude dirt. Shaft sizes 15/16" to 2-1/4". A favorite where compactness is at a premium.

BRONZOIL PILLOW BLOCK

Capillary bronze bushing has capacity of one-third its volume in oil. Reservoir with close fitting wick around bushing provides ample lubrication. Oil resistant and static proof grommets available for noise isolation. Sizes 1/2" to 1-1/4". America's standard for light applications.

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America's Most Complete Line

Working closely with air conditioning equipment manufacturers, Dodge of Mishawaka has developed bearings to meet the exacting operating conditions encountered in this industry. Cost-saving products for the mechanical transmission of power are manufactured by Dodge for use in all industries.

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BRONZOIL FLANGED BEARING

Mounted in heavy gauge steel flanged housing this bearing has the basic Bronzoil construction and characteristics as described at the left. Sizes 1/2" to 1-1/4". A proven performer in a new mounting.

CALL THE TRANSMISSIONEER

your local Dodge distributor, for information about the line of Dodge bearings for fan and blower service—and for news about Dodge products to cut costs and increase production in all industries. Look for his name under "Power Transmission Equipment" in your classified phone directory.

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NAME PLATES

FOR YOUR NAME PLATE REQUIREMENTS, WRITE OUR SUBSIDIARY, ETCHING COMPANY OF AMERICA, 1520 MONTANA STREET, CHICAGO 14, ILLINOIS

New MULTIPRESS Dial Feed Table

Will boost your production on small part processing!

★ If your manufacturing calls for rapid feeding of small parts, you'll get a surprising boost in your production figures using the new Denison Dial Feed Table Accessory. Crimping, pressing, marking, dimpling, stamping, broaching and shearing are but a few of the operations requiring a feed of this type.

You eliminate the use of extensive tooling except at the working station. Parts are loaded on the table or in holding fixtures, as desired. Finished parts are ejected at the working station or at a point 120° from this station, where punch-through provision has been made. The operator loads away from the press ram—away from dangerous moving parts for greater safety. Indexes may be set at 8, 12 or 24 per cycle, depending on the size of the part or the operating speed desired.

Low initial cost plus economy of operation, tooling and maintenance make this accessory ideal for Multipress users who have many short run operations, or other production where it is not practical to use extensive tooling set-ups. The Dial Feed Table is adaptable for use with either the 4, 6, or 8-ton Multipress. It can be furnished with or without the standard die set as illustrated. Write today for descriptive bulletin and complete information on this NEW, production-boosting Denison Dial Feed Table accessory.

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DENISON EQUIPMENT for APPLIED *Hydr*OILics

Inside Knowledge on Metal Processing Problems

—RUST—

This is One of a Series of Messages on Common Problems in Your Plant

HOW MUCH OF THIS BILL DO YOU PAY?

SLOW but none the less deadly, this monster "Rust" creeps into your plant, slides its tentacles over idle machines, breathes on metal parts waiting for additional operations and even reaches inside complete assemblies ready for shipment.

Once a year, it presents U. S. industry with a staggering bill for its occupation costs. Authorities say that this damage may reach as high as $500,000,000. What was your share last year? How much of this bill will you pay this year... and next?

Your Socony-Vacuum Engineer is ready now to help you answer these questions... and set up a complete rust prevention program to match your Correct Lubrication program.

★ ★ ★

The complete Socony-Vacuum Sova-Kote line includes specially developed protection for all requirements—S/V Sova-Kotes 102, 103 and 104 for heavy-duty protection outdoors; 201 and 202 for varying degrees of service indoors; 203 for inter-operational slushing; 302 for semi-enclosed assemblies; 501 and 503 for internal treatment of completely assembled machines, and 601 for semi-permanent protection of structural steel.

GARGOYLE Lubricants

SOCONY-VACUUM

SOCONY-VACUUM OIL CO., INC. and Affiliates: Magnolia Petroleum Co. General Petroleum Corporation

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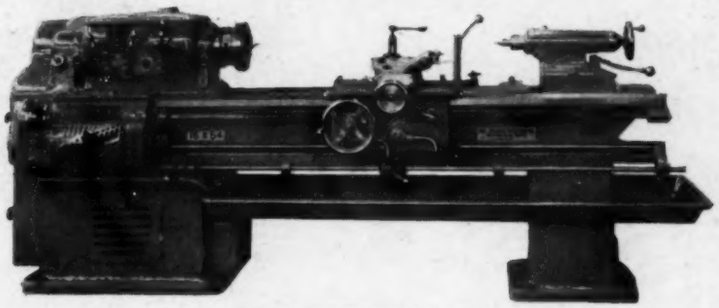
FOR EVERY RUST PREVENTION NEED

A POLISHED PERFORMER



Hendey 18 Speed Precision Lathe

When you want to be sure of precise production, when you must count on long-run performance, you need a Hendey 18-speed geared head lathe in your plant. It's a proven performer endowed with great accuracy, more-than-ordinary flexibility, and it's built to give years and years of polished performances.

Design of the Hendey 18 Speed Precision Lathe is simple, compact and functional. Its construction is rugged and accurate. All controls are conveniently grouped for ease and simplicity of operation. The spindle collar is accurately indexed for cutting multiple threads. Automatic lubrication takes care of all important bearings and slides. All headstock gears are hardened and shaved. The spindle rides in matched super-precision pre-loaded anti-friction bearings. The bed, carriage and apron are made of selected materials and supported and balanced to withstand the heaviest loads. Lead screw accuracy is ±.001" per foot of lead.

These are but a few of the outstanding details that make the Hendey 18 Speed Precision Lathe a polished performer – for complete information write for catalog today.

The Hendey Machine Company

Hendey

Main Office and Plant — Torrington, Connecticut

Offices — N. Y., Chicago, Boston, Detroit, Rochester, Los Angeles, San Francisco

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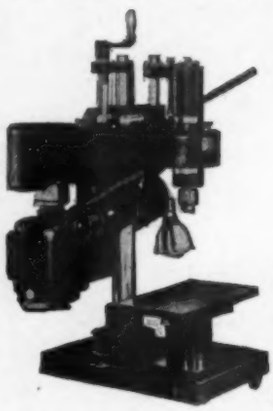
TOOL ROOM LATHES
12" - 14" - 16" - 18" - 20"

SHAPERS
12" - 16" - 20"

Modern watch-making requires a high degree of perfection and quantity production. The versatility of ARTER ROTARY SURFACE GRINDERS is shown by these examples of watch parts made for the famous Hamilton chronometer.
ARTER
ARTER GRINDING MACHINE COMPANY
WORCESTER, MASSACHUSETTS • U. S. A.



Hamilton Varimatic
Super-Sensitive
Drilling Machine

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SMALL, ACCURATE
PRODUCTION DRILLING

AT LESS COST PER HOLE

Hamilton Small Hole, Super-Sensitive Drills have many exclusive, patented features. Your small holes, .004" to 5/16", can be produced by these machines accurately and rapidly . . . and at less cost per hole.

Especially adapted to watch and clock manufacture and to the manufacture of instruments, business machines and other items where finest work must be performed on fast production schedules. These machines have stood the test of time. 80% of present installations are repeat orders.

Machines of various clearances, capacities and travel to fit your specific requirements. Write for bulletin.

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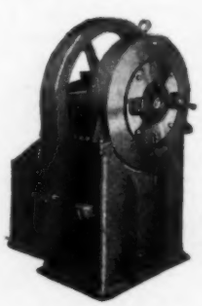
GEAR CUTTING MACHINES

Well Designed
Good Features
Create Production Advantages

43 Years' Experience

NEWARK GEAR CUTTING MACHINE CO.
69 Prospect Street, NEWARK 5, NEW JERSEY
FRANK E. EBERHARDT, *President*

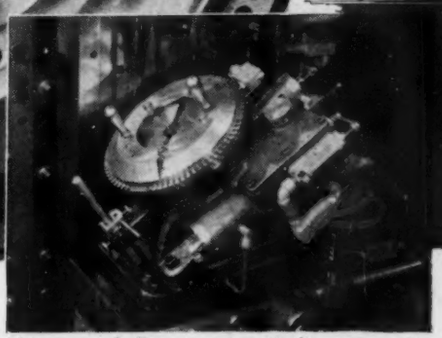


THE
TORRINGTON
ROTARY
SWAGING MACHINE

— with 4000 forceful squeezing hammer blows per minute—makes metal tougher and more elastic. Send for booklet—"The Torrington Swaging Machine."

The Torrington Co., Swager Dept.
56 Field Street Torrington, Conn.

so much depends on so little



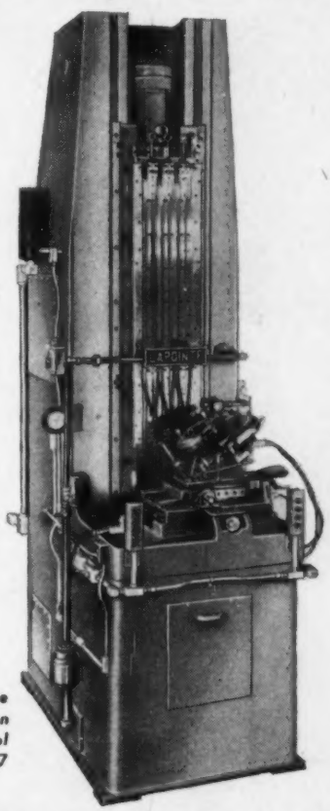
This unusual fixture automatically rotates for each of the 78 cuts.

Jet propulsion engines utilize every last fractional ounce of power. To achieve this, these tiny rotor blades must fit, with extraordinary precision, their appointed slots in the air compressor wheel. Only by broaching can the exacting tolerances required on both wheel and blades be attained with accuracy, economy and speed.

Seventy-eight angled slots are broached in the wheel by a Lapointe 15 ton, 66" stroke single ram machine, with a fixture designed to hold the piece at a 35° angle, and properly position it for the cuts. Three operations, roughing, semi-finishing and cutting the ball-shaped aperture at the base of the slot result in tolerances within .0005 inches, while maintaining a profitable production rate.

Since virtual perfection in machining is required to keep vibration to a minimum at tremendously accelerated speeds, the blade, too, is broached with extreme accuracy.

Comparable to broaching's contribution in this new field is the way this modern method of machining is meeting the ever-increasing demands of industry. Write Dept. 15 for 124 page Instruction Manual, containing full specifications on Lapointe machines.



15 Ton, 66" Stroke Single Ram Machine.

HUDSON LAPOINTE MASS.

THE Lapointe MACHINE TOOL COMPANY

HUDSON, MASSACHUSETTS • U. S. A.

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See our large exhibit of surface broaching machines in operation at the National Machine Tool Show, Chicago, September 17 through 26, 1947.

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Air Express goes coast-to-coast overnight, and speeds up to five miles a minute insure same-day delivery between many U.S. towns and cities. Use it regularly, and you'll be paid off in greater customer satisfaction and smooth-running, efficient operation. To solve overseas shipping problems, investigate fast, frequent, inexpensive International Air Express.

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65 lbs. auto parts in Louisville had to get to Dallas fast. Picked up 5 PM on 25th, delivered to consignee 7 AM the 26th. 773 miles —Air Express charge **$15.96!** Other weights, any distance, similarly inexpensive and *fast!*

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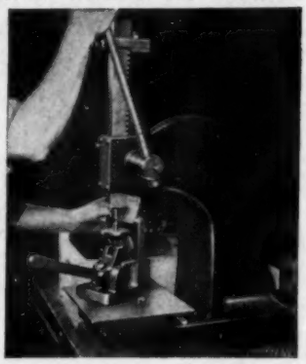
A manufacturer of automobile accessories and household appliances (name on request) has purchased 1,659 Famco Arbor Presses in the past decade for assembly operations. The cost to maintain these constantly busy machines averaged 14c per press over the 10-year period. These presses, in sizes to 15 tons pressure, require a small investment, speed up work, are easily portable, and save power and floor space. Write today for full details.



FAMCO MACHINE CO. • 1316 18TH ST. • RACINE, WIS.

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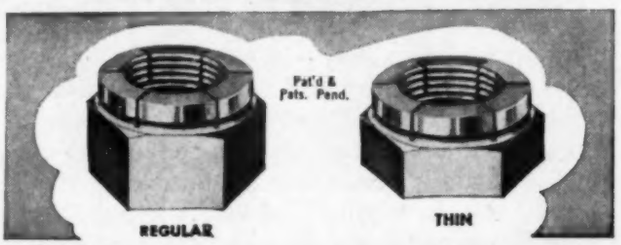

FLEXLOC

SELF-LOCKING NUTS

"Flexloc" is of one-piece construction, available in U.S.S. and S.A.E. thread series and can be made in such metals as Steel, Stainless Steel, Brass, Bronze, etc. Every thread—including locking threads—takes its share of the load. "Flexloc" accommodates itself to a very wide range of thread tolerances . . . can be used over and over again without losing much of its locking torque . . . is not affected by temperatures likely to be met within the field of Mechanical Engineering . . . being a "stop" nut, it stays locked in any position on the threaded member.

It is made by the manufacturers of the unexcelled "Unbrako" Socket Screw Products—guaranteeing quality. Sizes from #6 to 1" in diameter,—in both "regular" and "thin" types (shown above).

Millions of Flexlocs now in use.

OVER 44 YEARS IN BUSINESS

STANDARD PRESSED STEEL CO.

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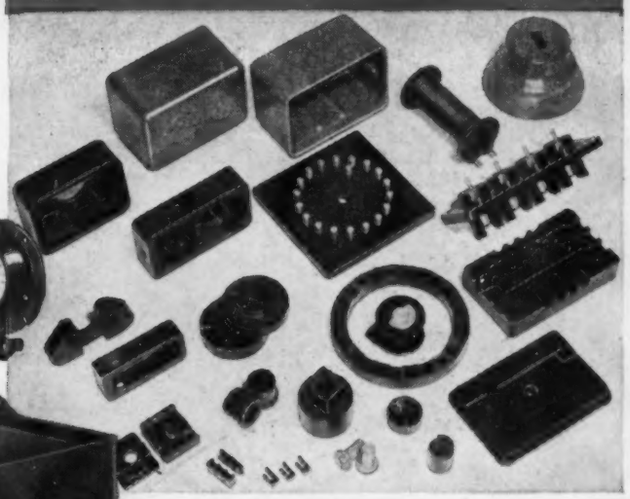

New! ELMES HYDROLAIRS

(Patents Applied For)

. . . FAST, ACCURATE, EASY TO USE, ECONOMICAL

PUMPLESS! MOTORLESS!

PRICES, f.o.b. Chicago

20-Ton, with 8" x 8" Platen
Bench-Type $680.00
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Bench-Type $770.00
Floor-Type $900.00
50-Ton, with 15" x 18" Platen
Floor-Type $1800.00
Hot Plates and other accessories, extra.

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Since 1851
HYDRAULIC EQUIPMENT

One of the *first* new Elmes Hydrolairs to go into service is this 30-ton floor-type press at the Grayhill Company plant in La Grange, Ill. It is used for molding plastic parts for relays, switches, and coils to a *closing dimension accuracy* of ±.002", on quantity runs.

According to Shop Superintendent Tylinski, blowing out the molds probably requires as much air as does *actual press operation.* Their compressor shows virtually no indication whatever of added load. During many months, the Hydrolair has performed with *utmost efficiency,* even when operated—as it frequently is—by women.

IDEAL FOR MANY USES

Elmes Hydrolairs are full *power-operated* hydraulic presses—ideal for molding plastics and rubber, for laminating, and for *many other* pressure purposes. They take their power through a flexible hose from any 90-lb., min., shop air line. No worry about foundations or floor loads. Placed *anywhere.* Easy to move. Quiet. Made in bench- and floor-type models. See prices at left. Order now for prompt delivery.

ELMES ENGINEERING WORKS *of* AMERICAN STEEL FOUNDRIES • 1001-13 Fulton St., Chicago 7, Ill.
Distributors in Principal Industrial Centers

METAL-WORKING PRESSES · PLASTIC-MOLDING PRESSES · EXTRUSION PRESSES · PUMPS · ACCUMULATORS · VALVES · ACCESSORIES

Mac-it ALLOY STEEL SCREWS

GET POSITIVE LOCKING ACTION
with
MAC-IT HOLLOW LOCK SCREWS!

Mac-it Hollow Lock Screws provide a locking arrangement that combines convenience with positive locking action. They lock as effectively after many thousand adjustments as they do the first time. *All* Mac-it screws are heat-treated and accurately made with die-cut threads. Whatever your needs, let the *complete* Mac-it line serve you. Sold through recognized distributors from coast to coast and in Canada.

DISTRIBUTED NATIONALLY BY
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MANUFACTURED BY
MAC-IT PARTS COMPANY LANCASTER, PA.

KEYSEATING
The Modern Way

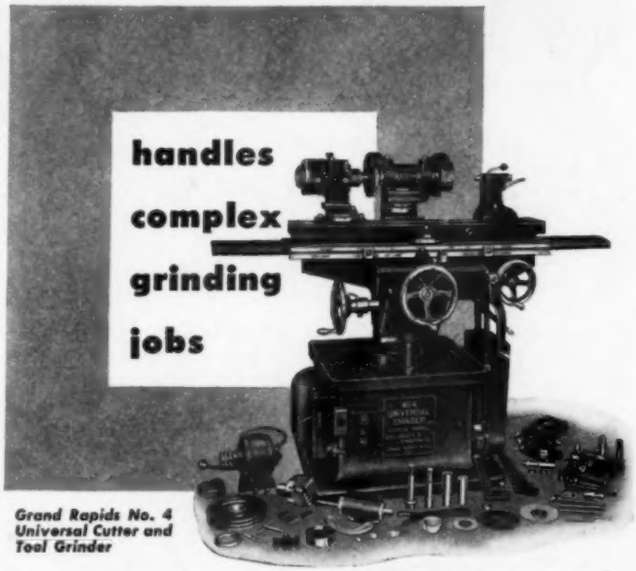
Illustration shows typical set-up for cutting taper keyway with table tilted.

Machines are made in three sizes for keyways 1/16" to 1¼" in width.

Great simplicity and ease of operation of Davis Keyseaters assure the user of accurate, time saving work.

Let our engineer study your keyseating problems.

DAVIS KEYSEATER COMPANY
403 EXCHANGE ST. ROCHESTER 8, N. Y.



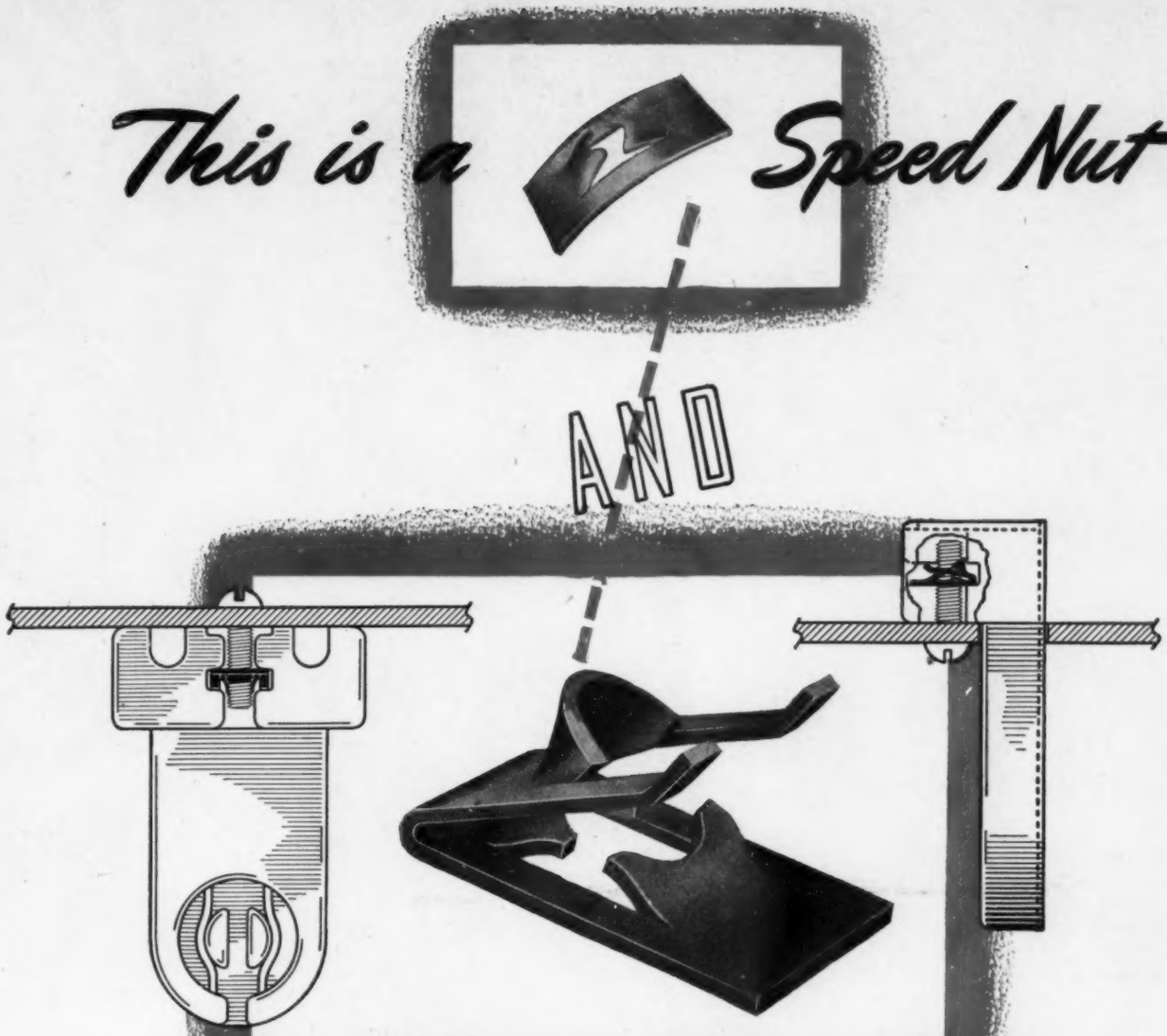
Grand Rapids No. 4 Universal Cutter and Tool Grinder

The extreme flexibility and versatility of the Grand Rapids Universal Cutter and Tool Grinder makes ordinarily complicated grinding operations really practical, convenient, simple and fast.

Write for Bulletin 1045

GALLMEYER & LIVINGSTON COMPANY
Manufacturers of Grand Rapids Grinders
330 STRAIGHT ST., S. W., GRAND RAPIDS 4, MICH.

This is a ★ *Speed Nut*



THIS is also a *Speed Nut*

● Here is a self-retaining, self-locating and self-locking SPEED NUT designed for fluorescent tube lamp sockets. But it's merely one of hundreds of special shapes that do more than merely hold the screw.

This SPEED NUT C6800 is zipped into the recess in the lamp socket to stay. The turned up ends of the spring arms "bite" into the plastic to lock the SPEED NUT firmly in place. It is self-locating because the extruded collar butts up against the back of the vertical slot to line up the SPEED NUT impression with the screw hole. It's self-retaining and self-locking because of the exclusive spring tension lock of the SPEED NUT Brand of fasteners. Fits any socket of this type using standard 6-32 machine screws.

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The photo shows what often happens to metal when used as ways on planers. Scored ways make accurate work impossible.

FORMICA ways on planer tables have proved their ability to support very heavy loads traveling at high speeds without creating heat that would warp the table, and maintaining a smooth even surface with no scoring. That means accurate work by the planer over a long life.

In fact the use of Formica for these bearing surfaces is one of the most significant advances in planer design during the past quarter century. It was developed by the G. A. Gray Company, Cincinnati.

Previously scored table ways, and warped tables, often threw planers out of line and made real accuracy impossible. But removing and renewing the table was such a difficult and cumbersome operation that planer users often went on for years struggling with an inefficient tool rather than take time out to put it back in shape.

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For many bearing surfaces where pressures are high Formica provides the answer.

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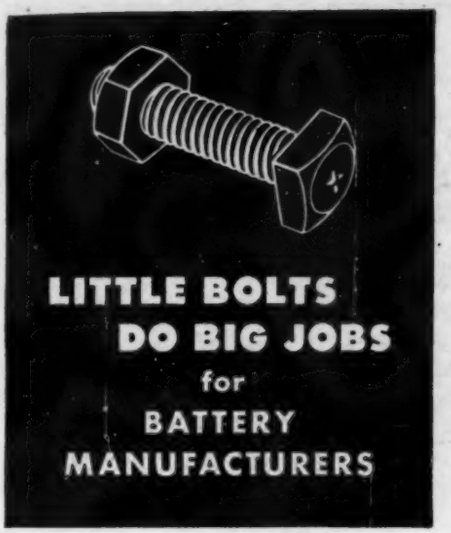

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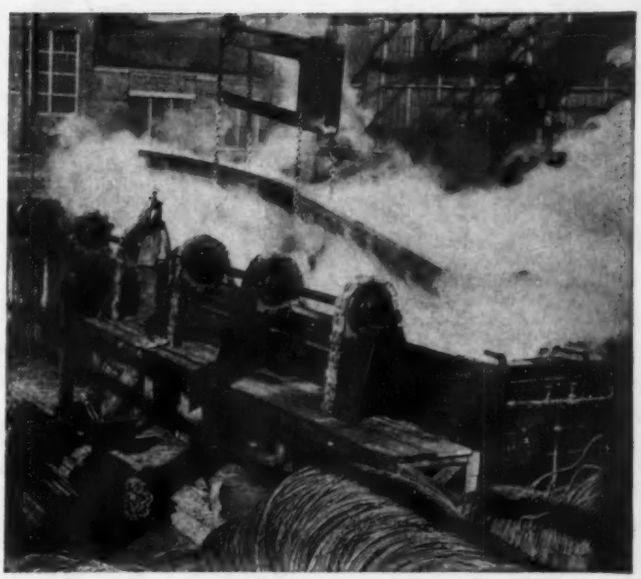

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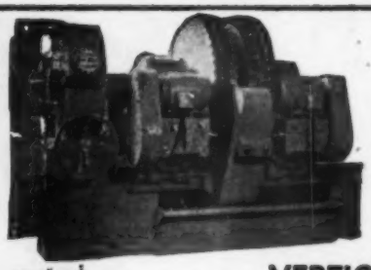
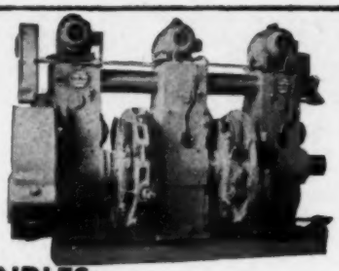


Roto-Matic MILLERS



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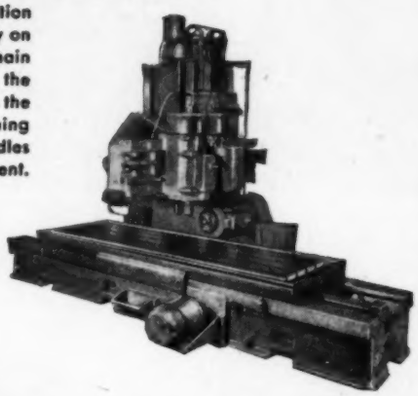

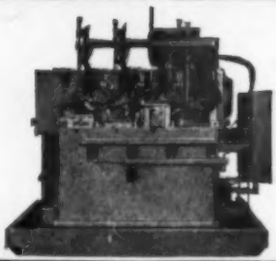

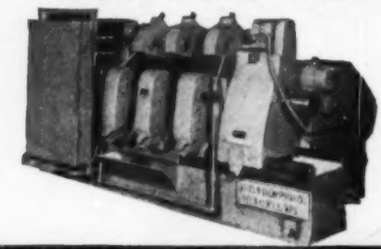

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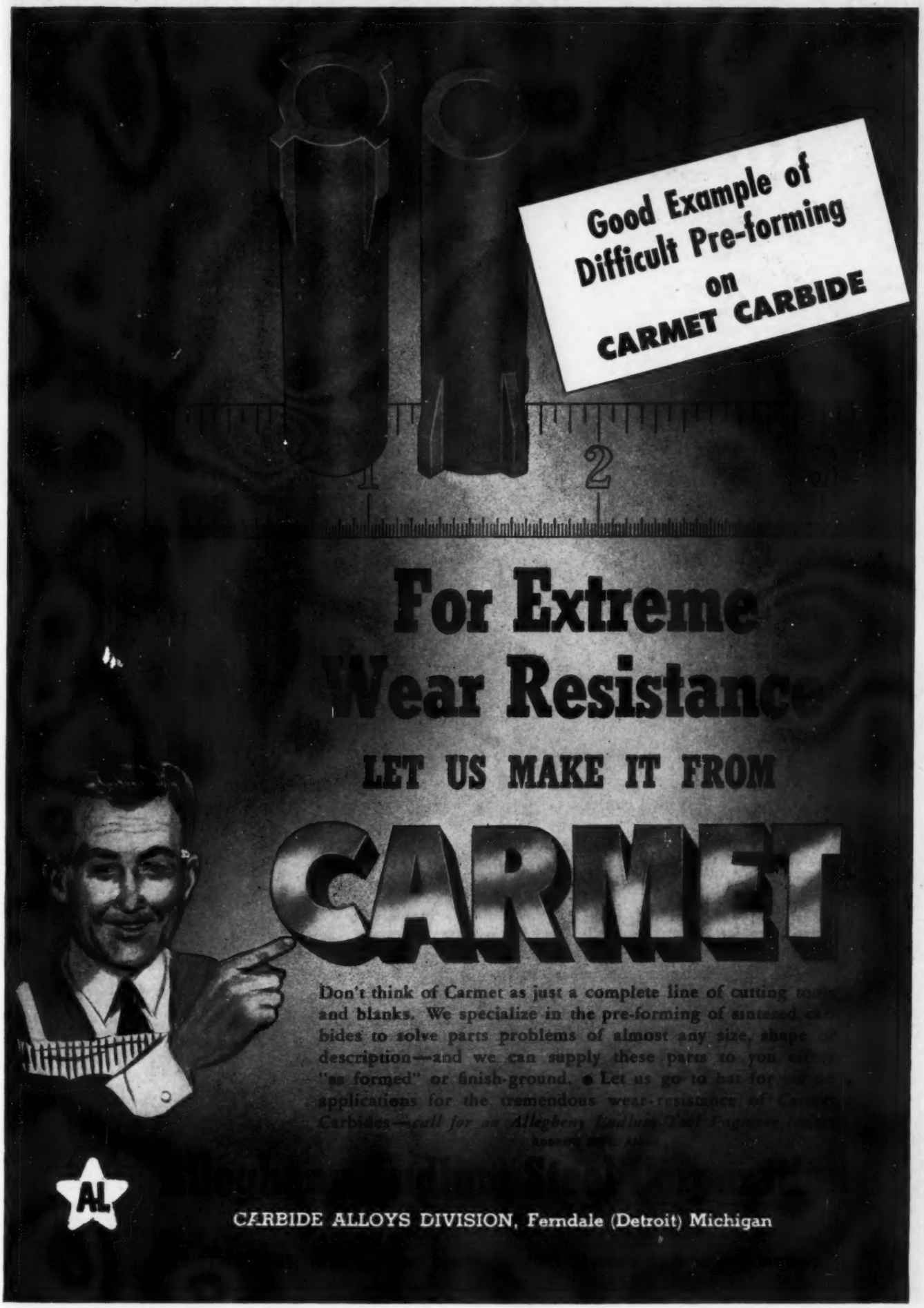
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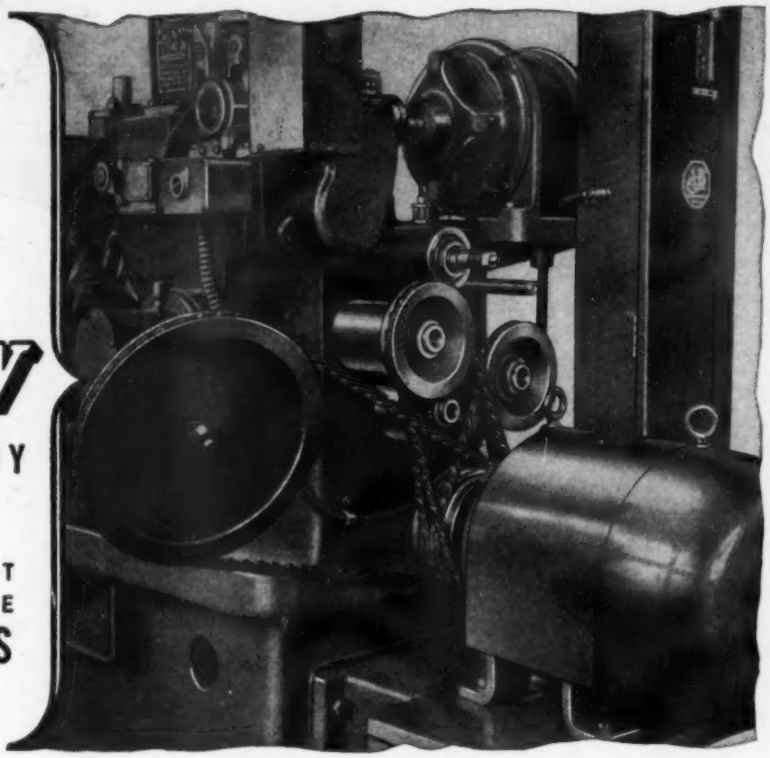

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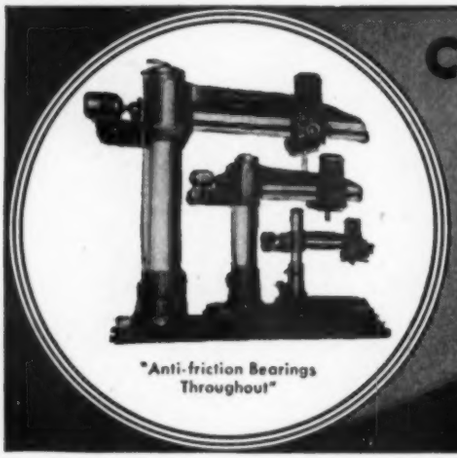

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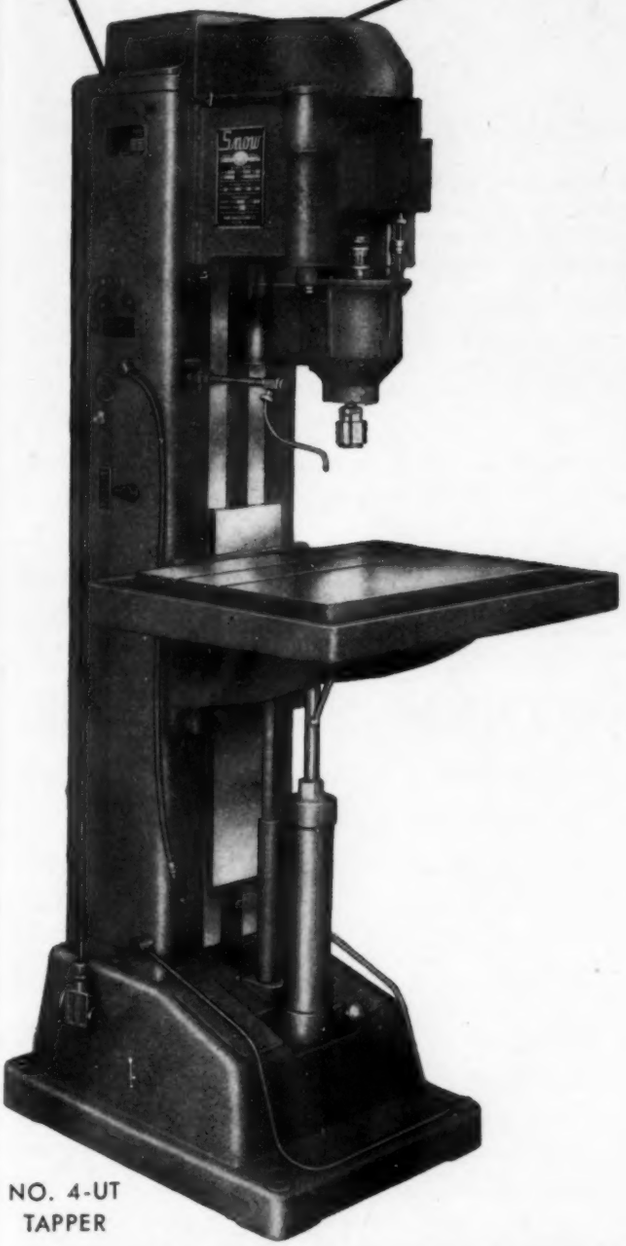

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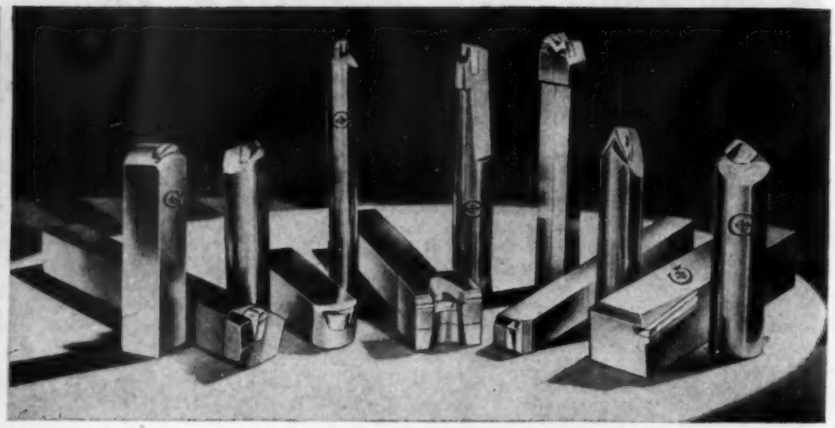

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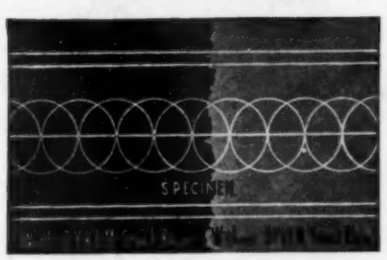

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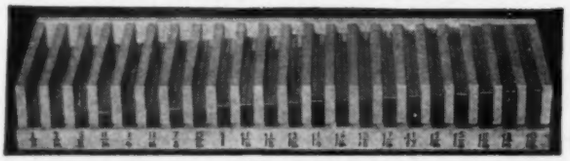

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Changing Flywheels to Welded Steel

BY L. C. BEATTY, PRES.
BEATTY MACHINE & MANUFACTURING CO., HAMMOND, IND.

In machining flywheel castings for our punches and shears, we occasionally ran into blow holes which necessitated scrapping of the flywheel and resulted in a loss of the machining man-hours. These unfortunate experiences led us to develop a line of welded flywheels built from homogeneous steel plate.

CUTS COST 20%

Not only have we eliminated former scrap losses, but we have cut the cost of our flywheels about 20% with the welded construction.

One of the cast iron flywheels is shown in Fig. 1. A welded flywheel is shown in Fig. 2.

Fig. 1. Flywheel of cast iron construction used formerly.

Fig. 2. A 50" welded steel flywheel after machining.

HOW IT IS BUILT

The 50" flywheel shown in Fig. 2 is built as shown in the sketch of Fig. 3. Interior fillet welds are made with the wheel in the flat position with one pass of ¼" Lincoln "Fleetweld 11" Electrode. The deep-groove welds that join the outer plates to the web are made downhand with the wheel in a motor-driven fixture as shown in Fig. 4. The grooves are filled with ¼" "Fleetweld 11".

We expect soon to install a "Lincolnweld" automatic outfit to make all of these welds. This equipment should reduce the cost of our flywheels even further.

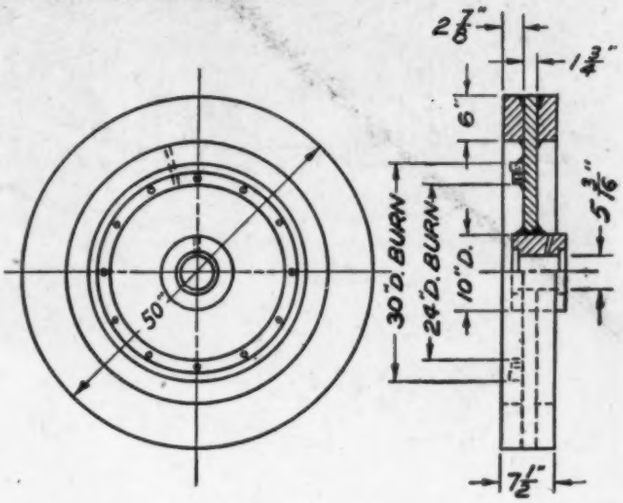

Fig. 3. Construction of welded steel flywheel.

Fig. 4. Welding flywheel in fixture.

Flywheels comprise just one of many parts for our shears and presses which we have changed over to welded steel design. In this development work we have found it helpful to have the Machine Design Studies published by Lincoln Electric. These may be obtained by writing The Lincoln Electric Company, Dept. 216, Cleveland 1, Ohio.

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MULTIPLE TOOLING

AUTOMATIC OPERATION

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• **MULTIPLE WHEELHEADS**

• **AUTOMATIC GRINDING CYCLE**

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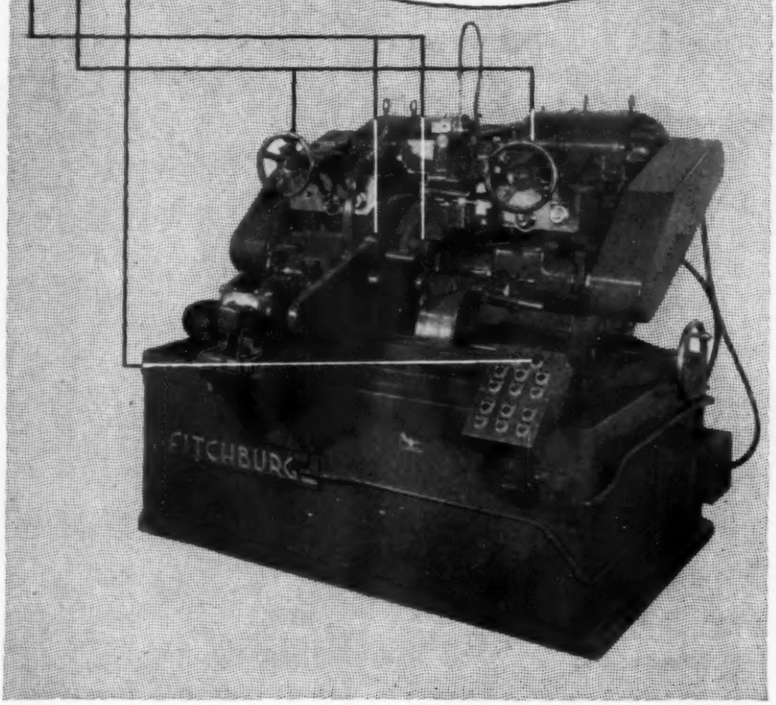

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The completely automatic cycle Fitchburg Bowgage Wheelheads may carry a standard-width wheel, two or more spaced wheels, or a wide wheel for use in formed wheel grinding. Each of the Bowgage Wheelheads is a complete, independent, precision unit—with *all* movements and controls completely self-contained. The wheelheads may all be operated simultaneously or in sequence, as desired.

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Investigate Fitchburg Automatic Multiple Precision Grinding. You'll be surprised at the number of operations that can be done at one setting, size held to tolerances previously not attempted—and all on a very high production basis. A letter, enclosing blueprints, will incur no obligation.

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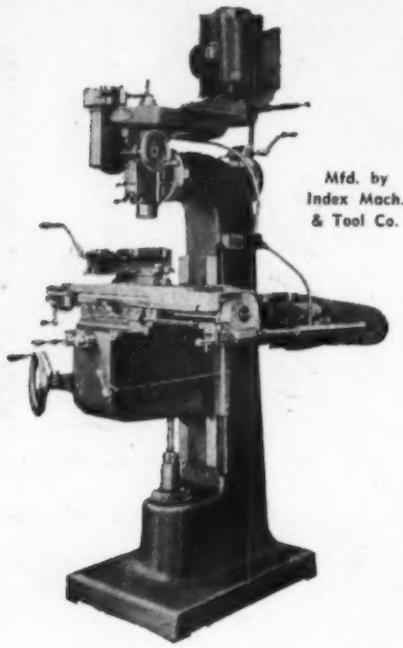

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For use on Index Mills or any other machine that will accommodate a 12" table.

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High Speed Polishing with unskilled labor made possible by the TYPE "A" "PRODUCTION"

This recent development in high speed polishing employs the Duplex Patent Two-Belt Process. This system comprises an abrasive belt running over a patent cushion leather belt, a combination providing high points for cutting and low points for ship clearance. As a result, the Type "A" can be depended on for high speed as well as high quality finishing.

Write for illustrated literature giving complete details.

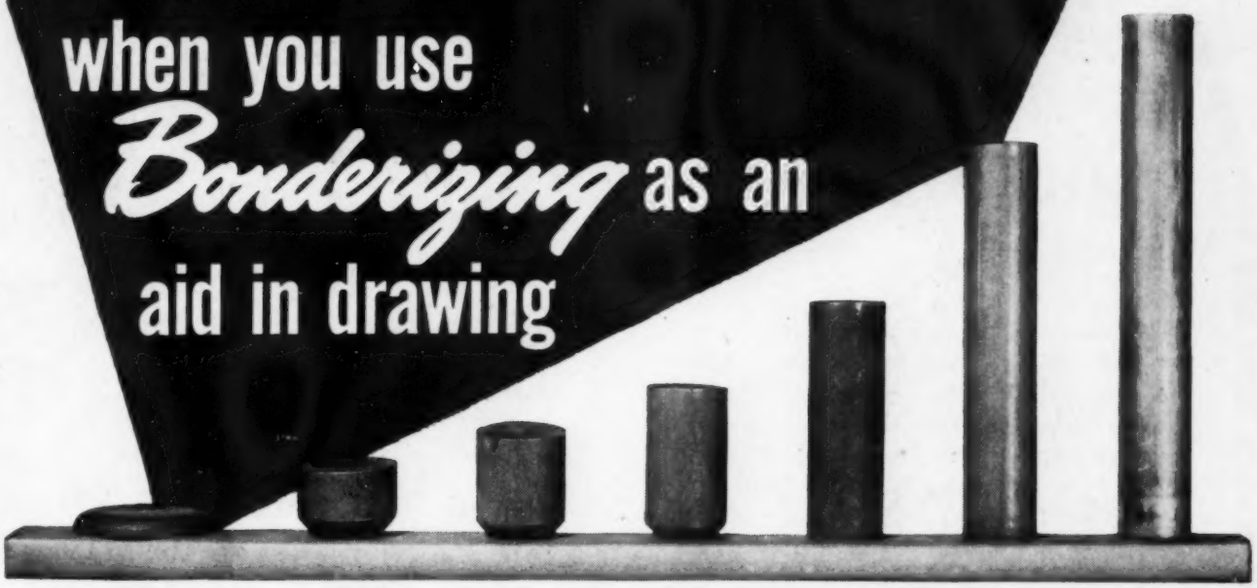
Specifications

Capacity: With power attachment, round stock from ¼" to 6" diameter.

Speeds: Driving pulley 1200 R.P.H.: leather cushion belt, 6300" per min.

Production
MACHINE COMPANY GREENFIELD, MASSACHUSETTS, U.S.A.

Not 1, but 8 ADVANTAGES when you use *Bonderizing* as an aid in drawing



1. Permits use of a wider range of lubricants
2. Allows wider variation in steel composition
3. Reduces metal-to-metal contact
4. Prolongs tool life
5. Permits faster drawing speeds and deeper draws
6. Reduces number of process annals
7. Reduces material breakage
8. Gives smoother finish to product

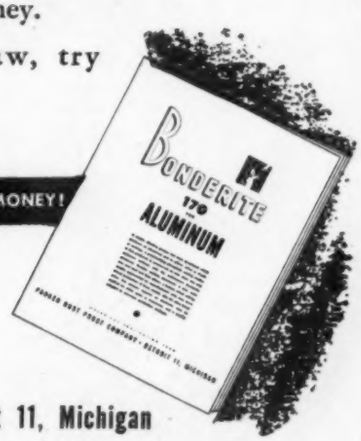
Here's how Bonderizing, used as an aid in drawing, acts to bring you these advantages:

The Bonderite crystals cover the work, integral with the metal itself. The crystals are nonmetallic, and act as a cushion between the die and the work. Under severe drawing pressures, the crystals stretch and are crushed, acting effectively to minimize scratching, welding and galling.

The Bonderite coating is absorbent, and thus holds lubricants more efficiently than untreated metals.

The combination of cushioning action, more positive lubrication, and the nonmetallic character of the Bonderite means less wear on tools and dies, faster draws, deeper draws, less spoilage, real savings in time and money.

To lick a tough draw, try Bonderizing!



FREE BOOK! IT MAY SAVE YOU MONEY!

Get technical bulletin "Bonderite As An Aid In Drawing." Write for your Free copy today!

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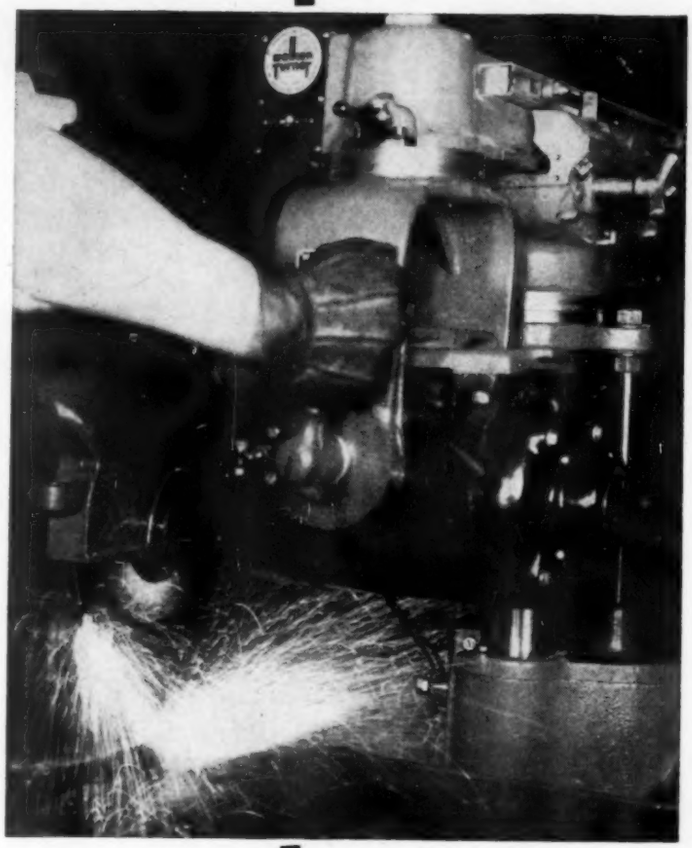
Bonderite, Parco, Parco Lubrite—Reg. U. S. Pat. Off.

BONDERIZING Holds Paint to Metal · **PARKERIZING** Inhibits Rust · **PARCO LUBRIZING** Retards Wear on Friction Surfaces

PARKER PRODUCTS CONQUER RUST

ACCURACY
For Metal Removal

● *Built by*
WALKER-TURNER CO., INC.



Whether it's used for cutting non-ferrous metals with a saw or ceramics and ferrous metals with an abrasive wheel, this Radial Cut-Off Machine removes metal accurately and quickly. This is due in a large measure to the almost effortless functioning of precisely-made SKF Ball Bearings on vital turning parts. In fact, performance is so smooth that the operator can instantly "feel the bite". SKF Bearings maintain their initial close tolerances indefinitely. They require no adjustments . . . need practically no maintenance and only occasional lubrication. Wherever you go in the machine tool industry, you'll find SKF Bearings proving year after year that they are the right bearings for the right places. 6280

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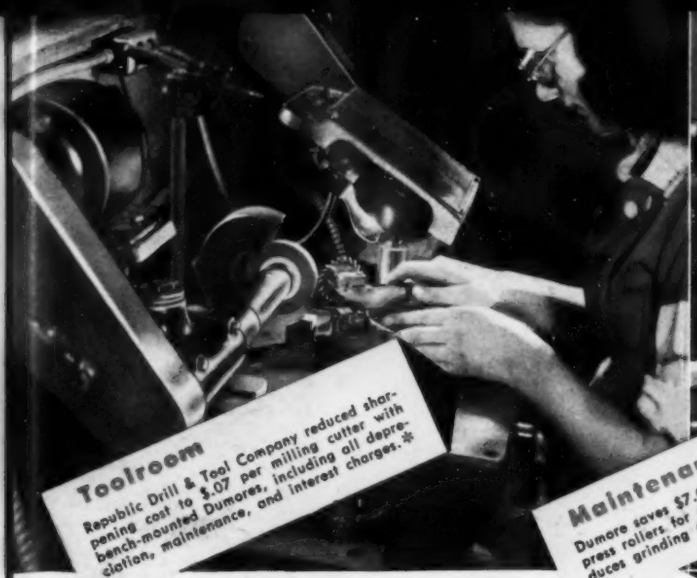
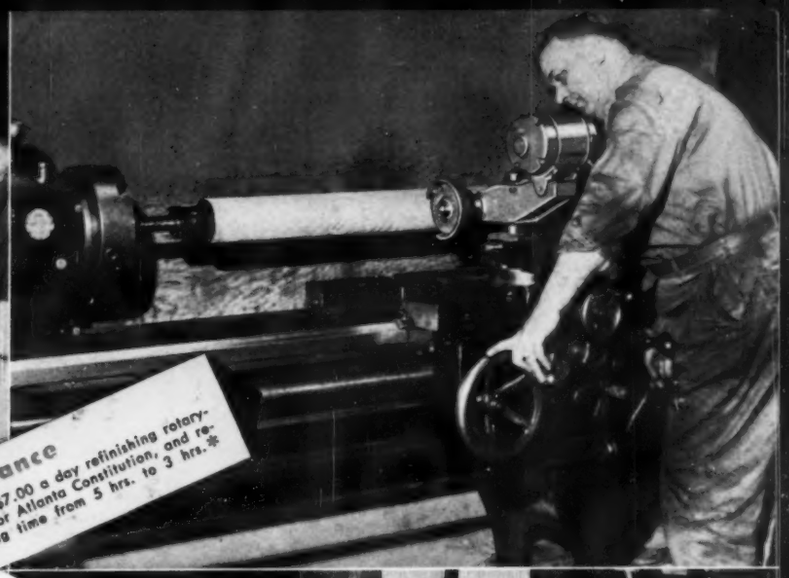


Toolroom

Republic Drill & Tool Company reduced sharpening cost to $.07 per milling cutter with bench-mounted Dumores, including all depreciation, maintenance, and interest charges.*

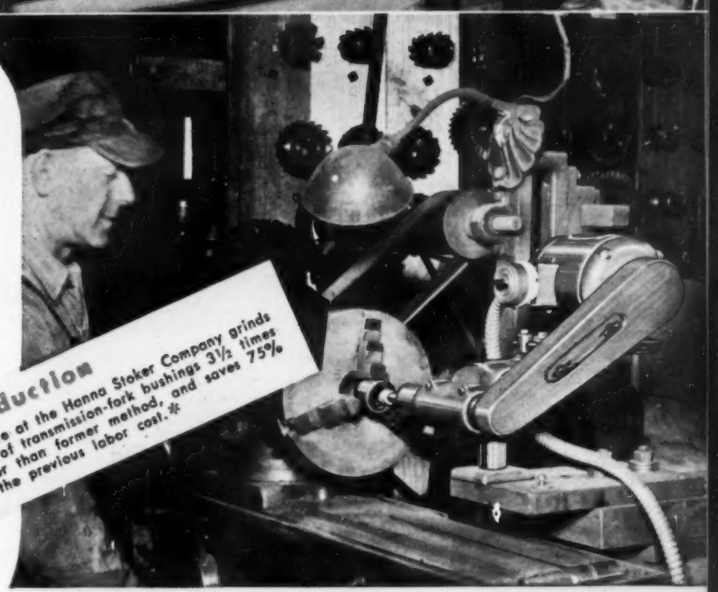


Maintenance

Dumore saves $7.00 a day refinishing rotary-press rollers for Atlanta Constitution, and reduces grinding time from 5 hrs. to 3 hrs.*

Cost accountants favor Dumores

and so do production, toolroom, and maintenance men who know how Dumores cut costs in all types of grinding . . .



Production

Dumore at the Hanna Stoker Company grinds I.D. of transmission-fork bushings 3½ times faster than former method, and saves 75% of the previous labor cost.*

*Cost figures attested by Certified Gould Reports.

If you want to cut your grinding costs, you can profit by the experience of scores of other companies. Versatile Dumore Grinders have established a new high in dependability—and *a new low in costs* —for production, toolroom, and maintenance work. They do all five types of grinding: external and internal cylindrical, surface, tool, and thread grinding.

A Dumore often enables you to avoid an investment in expensive special grinders —

- **by converting basic machine tools — equipment you now have — into dependable precision grinders.**
- **by combining with used machine-tool bases to provide inexpensive, dependable production grinders.**
- **by serving as variable-speed, precision work-heads for special machines or set-ups of your own design.**
- **by operating bench-mounted for off-hand or jig-and-fixture grinding operations.**

Send in the coupon on the next page for your free copy of *Here's How* — a book packed with reports on Dumore's grinding economy in 76 different plants. It gives you one idea after another for cutting costs on your own grinding jobs!

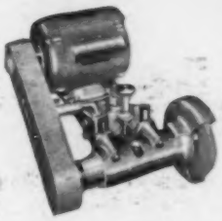
DUMORE

PRECISION TOOLS

Sold by leading distributors in all principal cities.

Turn the page for information on the complete line of Dumore cost-cutting tools and grinders.

7 Different sizes and types of Precision Dumore Grinders



No. 12
— 1 HP; speeds 2800 to 7750 rpm.; wheel sizes — 3" to 8"; for external work and internal to 24" depths.

No. 77
— ½ HP; speeds 3400 to 13,800 rpm.; wheel sizes — 1" to 6"; for external work and internal to 18" depths.

No. 7
— ¾ HP; speeds 4200 to 29,300 rpm.; wheel sizes — ⅛" to 5"; for external work and internal to 18" depths.

No. 5
—½ HP; speeds 4600 to 42,500 rpm.; wheel sizes — ⅛" to 5"; for external work and internal to 18" depth.

No. 44
—¼ HP; speeds 6600 to 38,500 rpm.; wheel sizes — ⅛" to 3".

No. 11
— ⅛ HP; speeds 6900 to 30,000 rpm.; wheel sizes — ⅛" to 3".

No. 14
—1/14 HP; speeds 10,000 and 22,500 rpm.; wheel sizes ⅛" to 2"

Dumore distributors stock this complete line to supply you the right Dumore for every grinding job

— and a Dumore is the right tool to reduce grinding costs in production, toolroom, and maintenance work . . .

Every grinder in the complete Dumore line — from the rugged 1 HP No. 12 to the midget, 1/14 HP. No. 14 — is designed and built to deliver the same high degree of accuracy (± .0001"). A Dumore's set-up speed, and adaptability to a variety of different jobs in a single work day, are indispensable in toolroom and maintenance work. Its versatility, accuracy, and sturdy dependability are cost-cutting advantages for production grinding.

Your nearby Dumore Distributor maintains a stock of this complete line. Let him recommend the size and type for your particular requirements.

Send in the coupon below, for your free copy of *Here's How*—Dumore's new 76-page case-study book, showing how 75 different companies have used Dumore tools and grinders to cut their production, toolroom, and maintenance costs.

See preceding page for cost-cutting Dumore grinder applications.

FREE! 76-page Grinding Manual of cost-cutting case studies

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PRECISION TOOLS

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Please send me, without obligation, my copy of *Here's How*, your manual of the newest techniques in grinding.

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4 Different Dumore Handgrinders

No. 8 HG
— 1/20 HP; speed — 18,000 rpm.; ⅛" capacity chuck or Jacobs No. 0 Chuck, 0 to ⅛" capacity.

No. 10 HG
— 1/10 HP; speed—22,000 rpm.; ⅛" capacity chuck or Jacobs No. 0 Chuck, 0 to ⅛" capacity.

No. 9 HG
— ¼ HP; speed — 15,500 rpm.; ¼" capacity chuck and extension arbor.

Duplex
— 1/14 HP; speed—17,000 rpm.; ⅛" capacity chuck with ⅛" and 3/32" adapters; flexible shaft attachment.

Plus

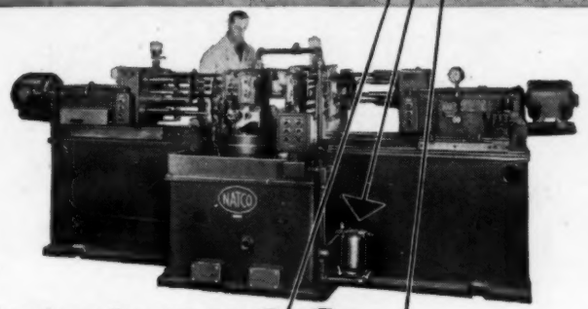
Sensitive Drill
— 1/30 HP; speeds 2000 to 15,000 rpm.; Jacobs No. 0 Chuck, 0 to ⅛" capacity. With foot rheostat to control speed.

No. 2 Flexible Shaft Tool
— 1/15 HP; speeds 500 to 10,000 rpm.; Jacobs No. 0 Chuck, 0 to ⅛" capacity. With foot rheostat to control speed.

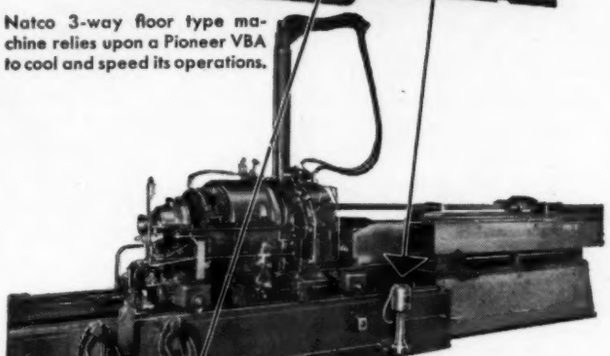
L-O-N-G L-E-N-G-T-H

of service is characteristic of PIONEER PUMPS

Three machine tools of great length which depend upon PIONEER PUMPS for a reliable coolant supply and long, trouble-free service.



Natco 3-way floor type machine relies upon a Pioneer VBA to cool and speed its operations.



Yoder flying rotary tube cutoff machine carrying a model VBD Pioneer Pump.

Colonial horizontal broach also uses a Pioneer Pump model VBA to send a uniform flow of coolant to the work point.

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FOR PUMPING COOLANTS · CUTTING FLUIDS
ABRASIVE LIQUIDS · LUBRICANTS · WATER

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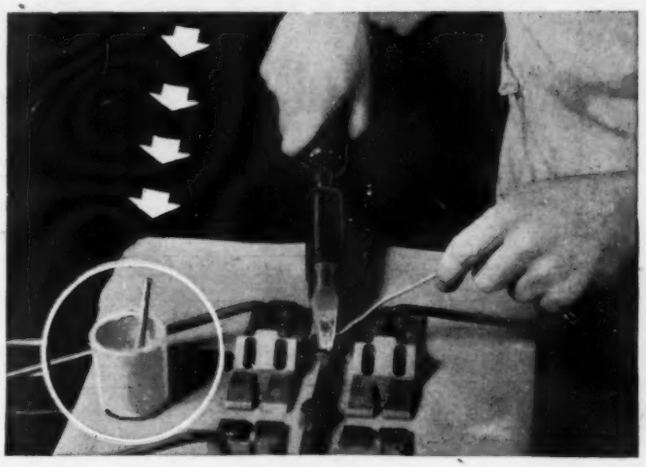
An effective FLUX for every soldering job



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• Nearly half a century of practical experience has resulted in the development by Kester of efficient and effective fluxes for every soldering operation. Proven in industry, Kester Fluxes are your assurance of clean, tight solder bonds—solder bonds that hold tight against vibration, shock, twisting, bending, and expansion and contraction caused by temperature extremes.

• Each one of the hundreds of Kester fluxes has been carefully tested in the laboratory and in practical application. Today, not only is the performance of each Kester flux definitely known, but also the circumstances under which each one should best be used.

• So look to Kester Fluxes for the answer to any flux problem. Without obligation to you, Kester engineers will gladly specify the flux that fits your special needs.

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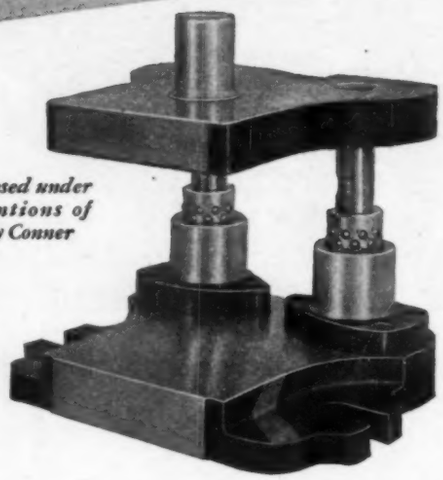
Solder Fluxes
STANDARD FOR INDUSTRY

LEMPCO PRECISION ANTI-FRICTION DIE SETS OFFER YOU ALL OF THESE 6 ADVANTAGES



Licensed under inventions of Guy Conner

Lempco's Pre-loaded Anti-Friction Guide Pin Bearings absolutely prevent any lateral motion between pins and bushings. As a result, they provide the following 6 advantages. Check them carefully. Each of them will play an important role in assuring the quality of your products and reducing costs.

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2. **Precise parallelism of punch and die holder.**
3. **Die sets can be opened and closed by hand . . . saves up to 60% of die assembly time.**
4. **Eliminates galling or seizing of pins and bushings which reduce costly downtime.**
5. **Insures greatly increased die life.**
6. **Positively eliminates all lubrication problems.**

FREE: *Write for fully illustrated catalog, that is packed with factual evidence that proves all of the above advantages.*

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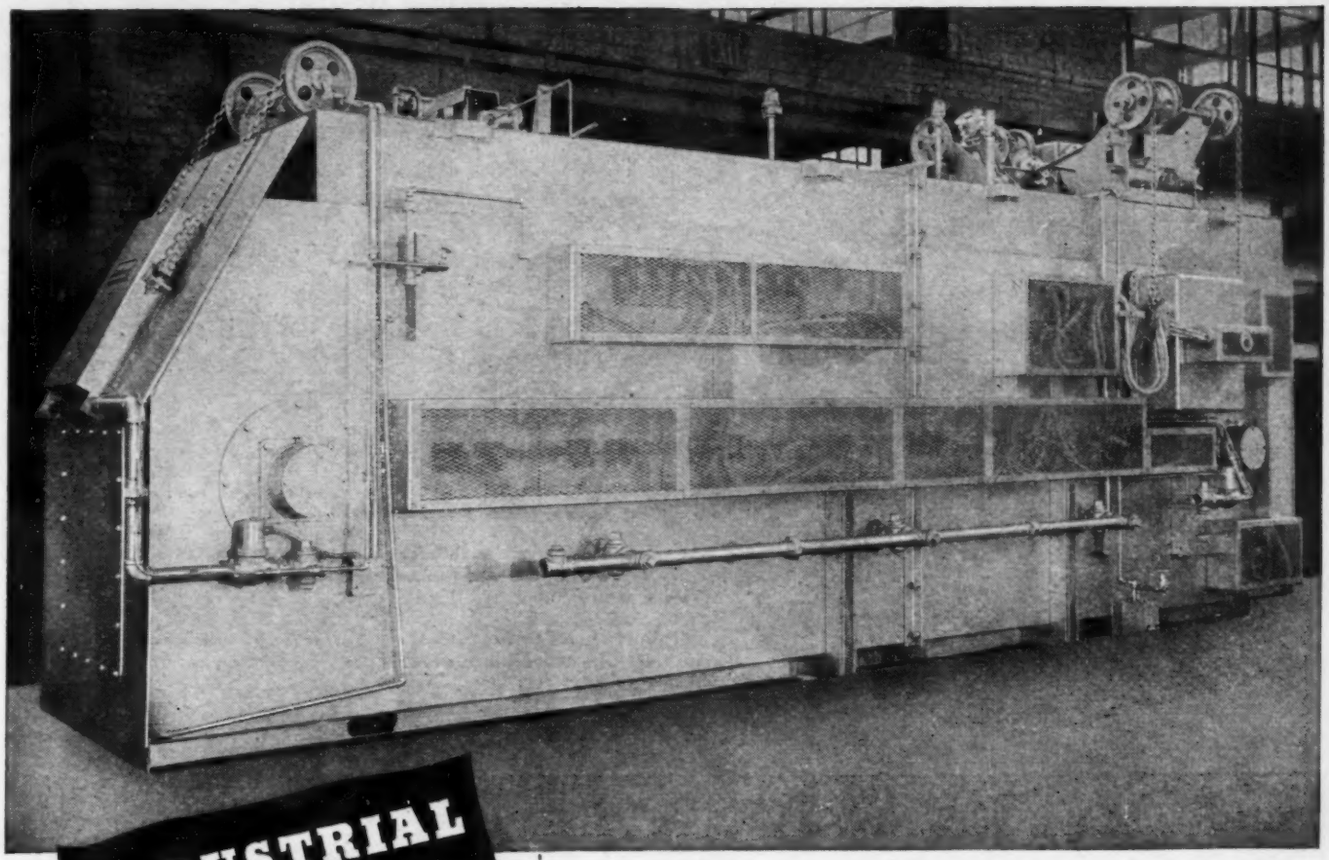

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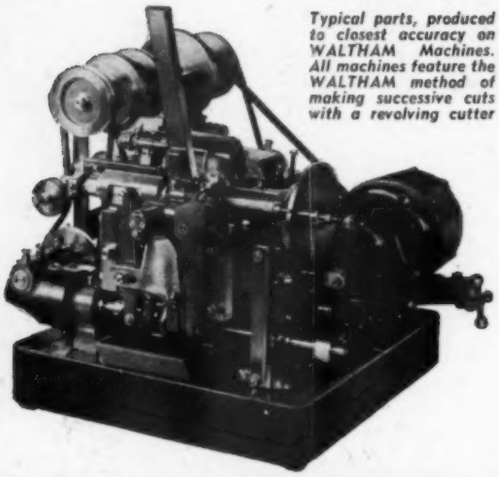
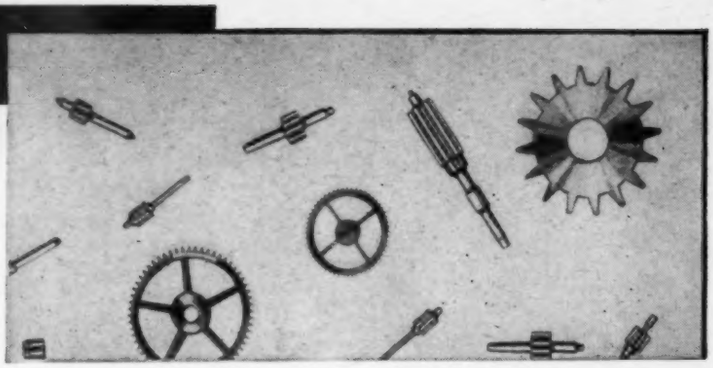
WALTHAM
PINION & GEAR CUTTING MACHINES

for precision production of fine pitch mechanisms



Typical parts, produced to closest accuracy on WALTHAM Machines. All machines feature the WALTHAM method of making successive cuts with a revolving cutter



Single-Cut Pinion Machines This machine employs one cutter. Blank is positioned and machine started by hand, all other movements being automatic.

Multiple-Cut Pinion Machines Two or three cutters on arbor of cutter spindle make successive cuts. Machine stops on completion of last cut.

Magazine-Fed Pinion Machines Provides continuous production of one kind of pinion. Magazine is loaded and all other operations including cutting and ejecting are automatic and continuous.

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Write for literature giving detailed specifications

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. . . the tool that converts drilling machines into key-seaters and saves time and money

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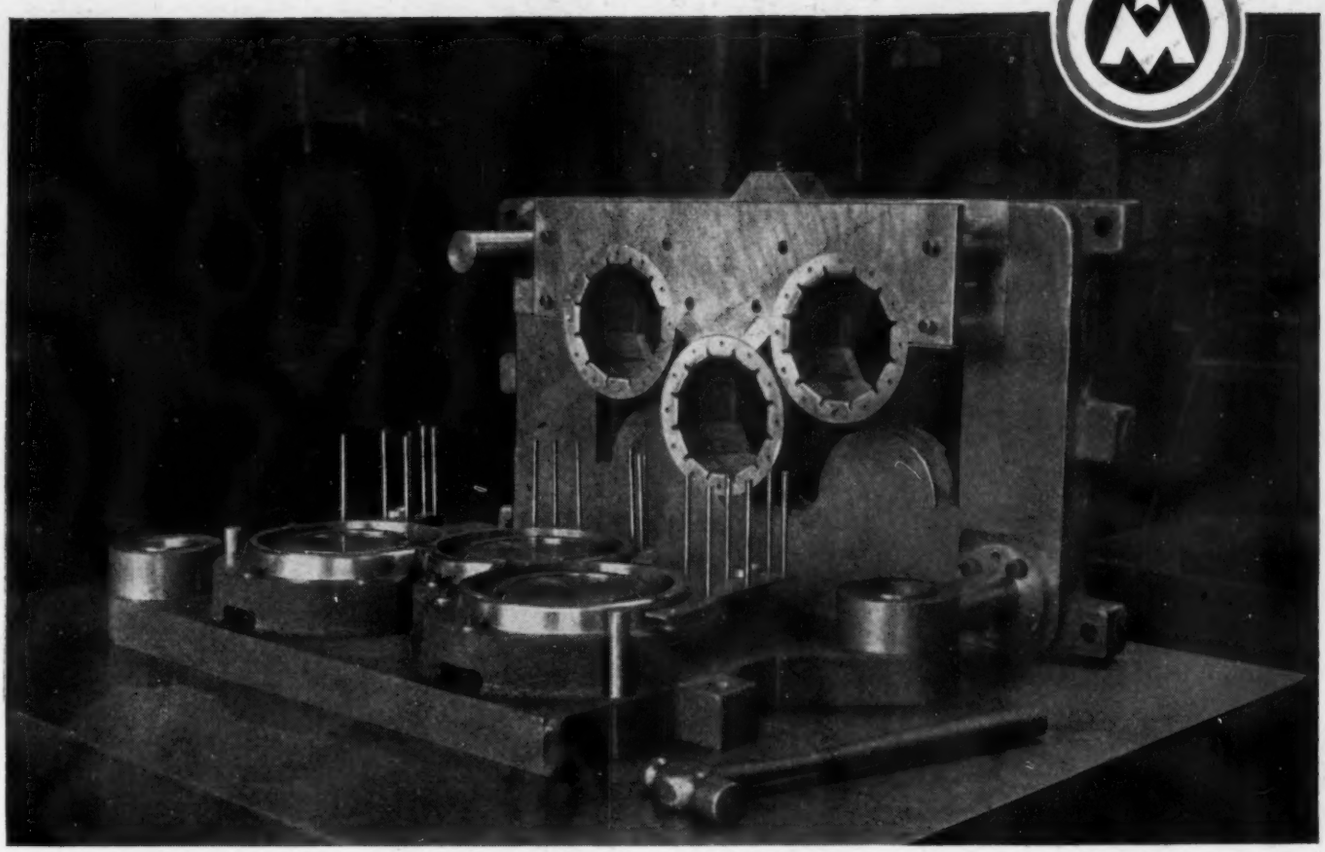

MIDVALE ALLOY DIE STEELS

Midvale Alloy Die Steels are the product of constant research and development directed toward producing materials best adapted to your particular requirement. They include steels for lamination dies, forming dies, gauges, jigs, blanking dies, broaches, thread rolling dies, etc. Grades regularly produced and carried in stock are Midvale Diamond Brand (high carbon-high chrome), Midvale Diamond A (high carbon-high chrome), Midvale Constant, Midvale ND and Midvale #77.

Specific information concerning these materials is available upon request in the form of printed matter. Our metallurgical staff will be glad to make suggestions based upon your special needs.

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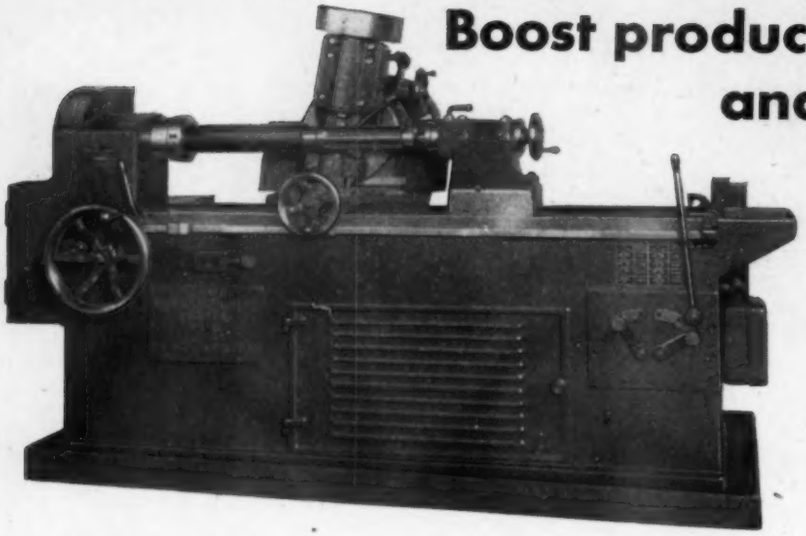

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Ask for Catalog No. 501 describing the Adams Manufacturing Hobber and the Adams Gear Hobber and Thread Miller.

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Ball & Bronze bearing throughout.

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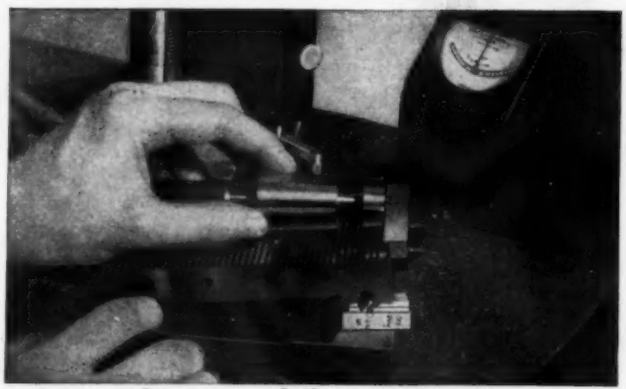

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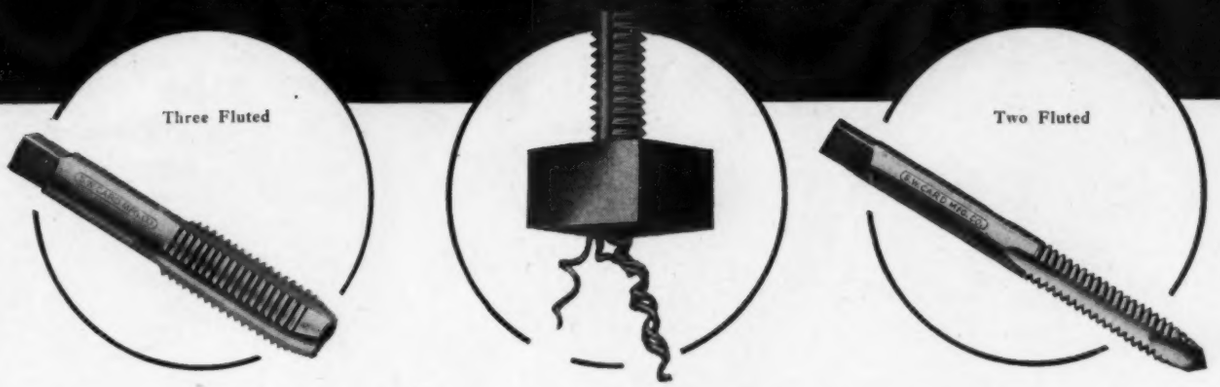
CARD SPIRAL POINTED TAPS

for free, accurate thread cutting in deep holes



Designed for tapping deep through holes or blind holes drilled deeply enough for chip clearance at bottom of hole. Cutting is done by the first few threads milled at an angle. Chips are forced ahead of tap, preventing chips clogging in flutes, thereby increasing strength of tap and minimizing chances of breakage.

CARD SPIRAL POINTED TAPS assure free cutting, and fine quality threads. Furnished in carbon steel and high speed steel types. Fully described in Card Catalog, available promptly on request.

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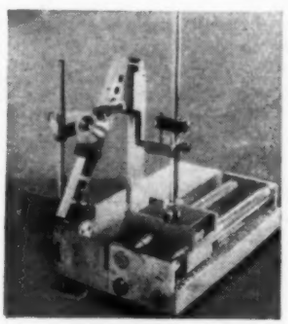

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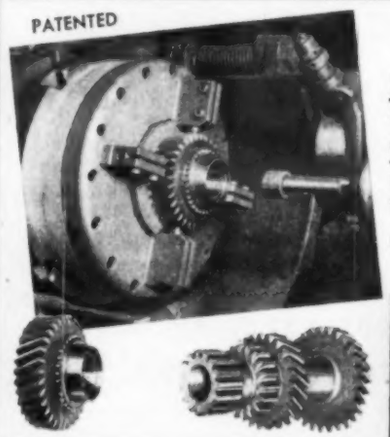

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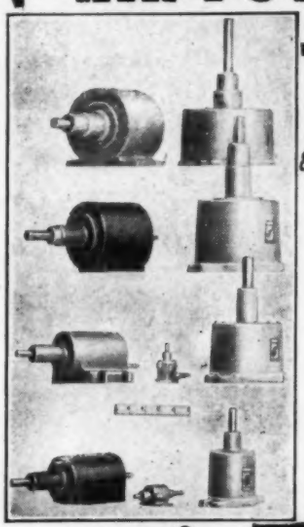

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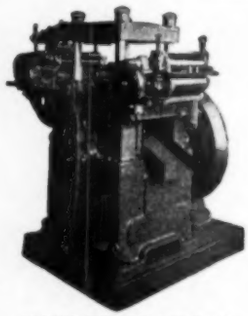

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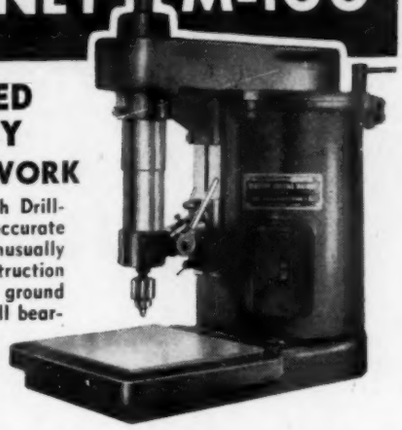

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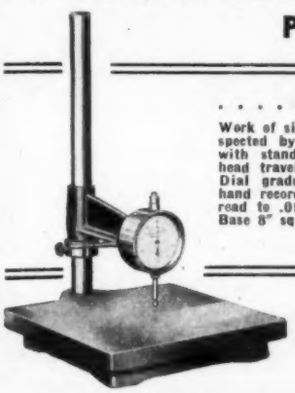

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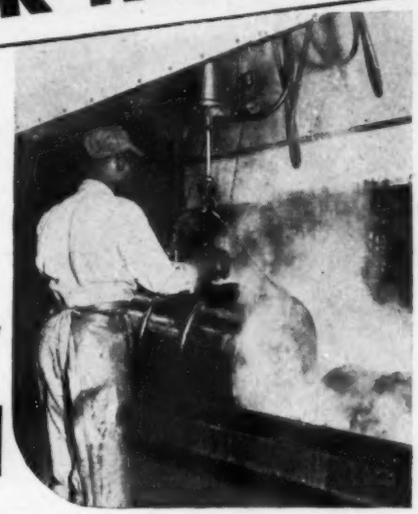

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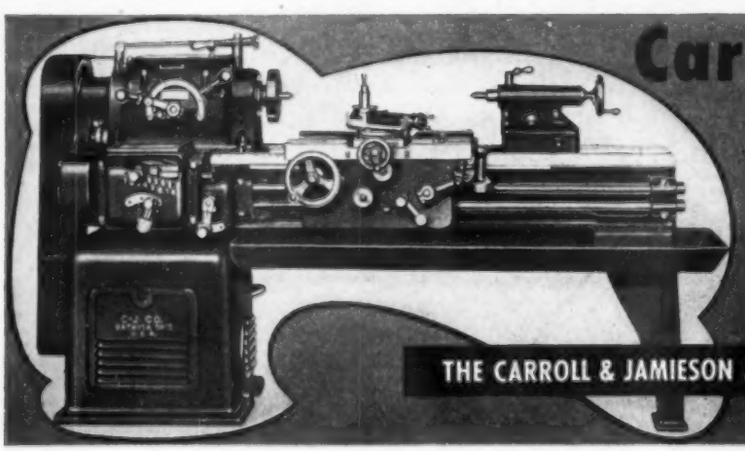

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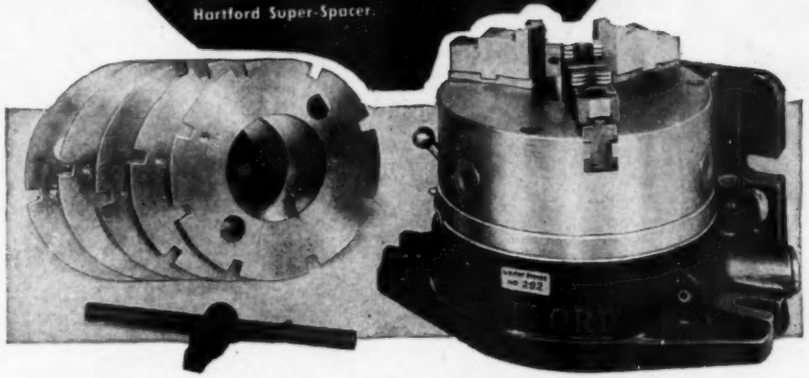

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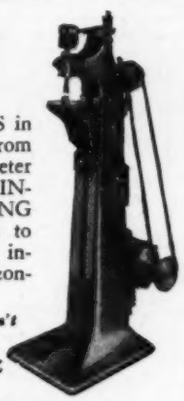

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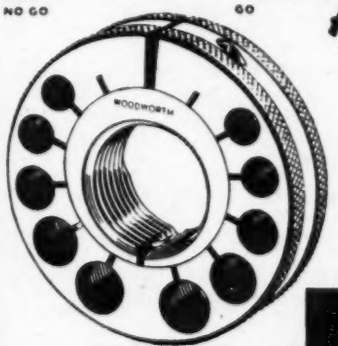

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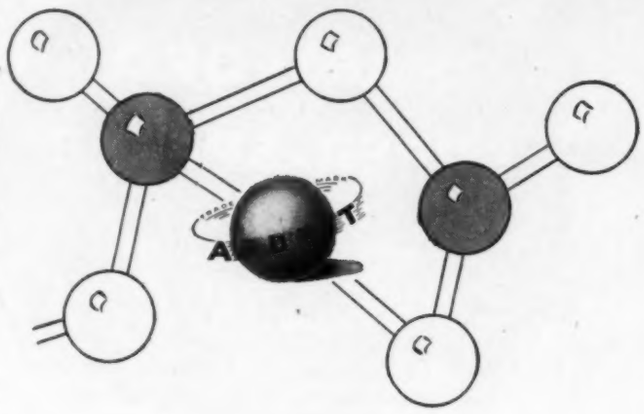

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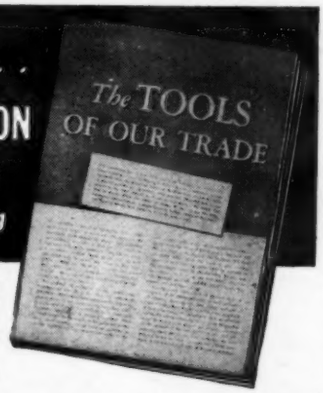

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SALARIED POSITIONS $2,500-$25,000. This thoroughly organized confidential service of thirty-seven years' recoknized standing and reputation carries on preliminary negotiations for supervisory, technical and executive positions of the calibre indicated through a procedure individualized to each client's requirements. Retaining fee protected by refund provision. Identity covered and persent position protected. Send only name and address for details. R. W. Bixby Inc., 443 Delaware Ave., Buffalo 2, N. Y.

POSITIONS WANTED

PLANT SUPERINTENDENT or Manager. Age 49, 25 years practical experience manufacturing light, heavy, precision, sheet metal products, tools. Dies, precision machining, stamping, forming, welding finishing, know how, mass line production, cost, continuous labor relations. Salary $7200. Location immaterial. PW-952, American Machinist, 330 W. 42nd St., New York 18, N. Y.

PERSONNEL MANAGER: 11 years experience in planning and supervising personnel programs in steel, aluminum and foundry industries. Background of engineering education, engineering and sales work. Presently employed in administrative capacity by Federal government. Desire position with company whose basis industrial relations policy is to develop essential cooperation between management and employees. PW-965, American Machinist, 330 W. 42nd St., New York 18, N. Y.

GEAR SPECIALIST—12 years experience with gear hobbers and threadmillers, who is capable of analyzing and correcting gear, tooling, and machine troubles desires position with gear manufacturer. Experienced in spline, spur, helical, and worm gearing; milling worms, threads, and leadscrews. PW-966, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

RECENT CONSULTING Engineer manufacturing procedures and methods. Excellent record of accomplishment in the design and development of products and the adoption of tooling and production facilities. Can organize and follow-up work to have it completed in a satisfactory and economical manner. PW-1016, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

Additional Employment Ads on Page 252

Auction Advertising on Page 260

WANTED
Manufacturing Engineer

A fifty-year old company employing about 3,000 people has an opening for a competent Manufacturing Engineer. Successful candidate will preferably be between 40 and 50 and have a Mechanical Engineering degree or background.

He should have experience in tool planning, tool design and toolmaking, and in the selection of machine tool and other equipment. He should be versed in the manufacture — involving metal working and assembly — of relatively complex electro-mechanical devices of high quality. He should have capacity for assuming leadership in the development and operation of wage incentive plans. Experience should preferably cover both job shop and mass production.

In applying, give your age and relevant information as to marital state, education, positions held, length of service, compensation received and your reason for leaving. If a recent informal photograph is available, it would be helpful for this to be included; it will be returned if so desired. Application will be held in strictest confidence until after personal interview.

P-971, AMERICAN MACHINIST
520 N. Michigan Ave., Chicago 11, Ill.

WANTED
PRODUCTION ENGINEER

to make a survey of a gear jobbing plant and make recommendations which will promote greater efficiency in all phases of gear manufacturing. Write stating experience.
Box 532, Times Tower
N. Y. 18, N. Y.

REPRESENTATIVE WANTED

Detroit shop with national reputation specializing in spline & serration gages & arbors, and small gaging fixtures, would like to appoint representative for eastern territories. This is one of the oldest shops in the business. Applicant must supply references.

RESKA SPLINE PRODUCTS CO.
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SEARCHLIGHT SECTION

(Continued from page 251)

SELLING OPPORTUNITIES WANTED

DETROIT ENGINEERING Sales Organization with established office and warehouse offers responsible sales representation. Montgomery Engineering Co., 672 W. Hancock, Detroit 1, Michigan.

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Model RA-6 six spindle Acme-Gridley Automatic, including tooling and equipment, Serial No. 22377A.—Practically new.. $2450

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Hobart Electric Arc Welding Machine, 300 amperes, 20 H.P. motor, 220/440 v., 60 cycle, 3 phase—Practically new.... 135

Model BN-69900 Table Blast, Serial No. A-46680, mfd. by the American Wheelabrator Corporation—Practically new.. 4225

Model #162 Bliss Power Punch Press, about 35 ton capacity, 4" stroke, complete with 3 H.P. motor and magnetic starter—practically new..... 1050

Model #5012 Bliss Power Punch Press, about 90 ton capacity, 8" stroke, complete with 10 H.P. motor, bed area 13"x52"—Practically new..... 2725

Model #3 Waterbury Farrel Power Punch Press, about 20 ton capacity, 2½" stroke, bed area 10¼"x14¼"—Practically new 575

Model #6600 Waterbury Farrel Power Punch Press, about 56 ton capacity, 6" stroke, bed area 10"x45", complete with 5 H.P. motor, push button switches—practically new..... 1750

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Cleveland Automatic Screw Machine, 3¼" capacity—Old machine..... 250

Gridley Automatic screw machines, 3" capacity—Old machine..... 200

Hendey milling machine, quick change feed gear, table size, 9½"x30", back geared belt drive—Old machine..... 175

18" Cincinnati miller, table size 9¼"x34", flat belt drive, table travels horizontal, adjustable head—Old machine..... 175

#5 Waterbury Farrel Blanking and Cupping Press..... 450

Milwaukee Model 104 Portable Moulding Machine 300

Model #57 Multigraph Machine..... 200

BILLARD MACHINE & TOOL COMPANY
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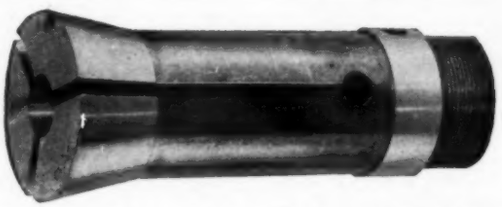

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Extra large stock of 2⅜" R.A. 6 Gridley parts and collets.

We have a large stock of used collets and parts for Acme, 52, 53, 55 & 56, Acme Gridley, Cleveland, Cone, Foster, No. 4 and No. 6 Warner & Swasey, Bardons & Oliver, Brown & Sharpe, Garvin and New Britains.

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14"x6' Rockford Cone drive (two)
16"x6' American Motor Driven Lathe
16"x8' Monarch Geared Head Lathe
18"x10' American, Geared Head, Taper
18"x6' American Q.C.G. motor drive
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20"x11' Schumacher-Boye, M.D.
24"x12' LeBlond Heavy Pattern
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32"x16' Bridgeford geared head
20"x8' Lodge & Shipley, motor drive
24"x22' Lodge & Shipley, G.H.M. drive

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2—#4 Warner & Swasey Universal Turret Lathe, Motor Driven
16" Warner & Swasey Brass Lathe
#2A Warner & Swasey Universal
#3A Warner & Swasey Universal, motor drive
#4 Foster GFH Hand Turret Lathe
3—Morey #2G Geared Head Turret Lathe, motor drive (late model)
2—Simmons #2 (microspeed) Turret Screw Machine (late model)
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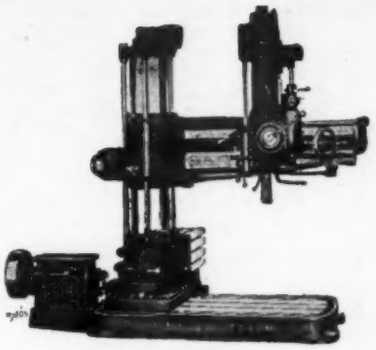

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5' Arm, 13" Column Cincinnati-Bickford
5' Arm, 14" Column Fosdick, motor drive
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Cincinnati-Bickford 5' Arm, 13" round column with air clamp. Oil grooved, tee slotted base, side base, with plain box table with #5 Morse Taper spindle. Motor drive.

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P & W 2½" Duplex Spline Miller
Thread Miller, Hall Planetary #1—24"
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#1, #2 Kempsmith Plain Millers
#3B Hendey Universal Miller, motor drive
#4 Cinn. Vertical High Power Miller. (2)

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Blanchard #16 Vertical Rotary Surface Grinder, motor drive
Pratt & Whitney 14" x 36" Vert. Surface Grinder, motor drive
12" No. 22 Heald Rotary Surface Grinder
16" Persons-Arter Rotary Surface Grinder
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Oliver of Adrian Drill Grinders
Cincinnati Centerless Grinders #2 M.D.
#12 Greenfield Internal Hydromatic Grinder, sizematic type
#2 Brown & Sharpe Surface Grinder
#70 Heald Internal Grinder
#60 Heald Cylinder Grinder
10"x18" Norton Cylindrical
2—Cincinnati, #1½ Tool & Cutter Grinders

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3½" Bar Landis-Rochester Horizontal Boring Mill, Model #36
#31 Lucas Horizontal Boring Mill, 3" bar

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200 ton A.C.F. Hydraulic Press. Bed. 24"x36", 4-post.
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No. 4 Cincinnati Plain
No. 4 Cincinnati High Power Plain
No. 2H Milwaukee Vert. (1942)
No. 2 Cincinnati Vert. (1942)
No. 2M Cincinnati Vert. (1941)
No. 3 Standard Milwaukee Vert.
No. 3 Cincinnati Vert. Dial Type
No. 3 Cincinati Vert. High Power
No. 3K Milwaukee Vertical
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24" Cincinnati Production
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No. 2 Hanson-Whitney Thread
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No. D-8 Colburn No. 6 M. T.
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No. 1A Warner & Swasey, Preselector (1942)
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10"x72" Colonial Broach Grd.
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Norton Motor Driven Grinders, sizes 6x18 to 24x240

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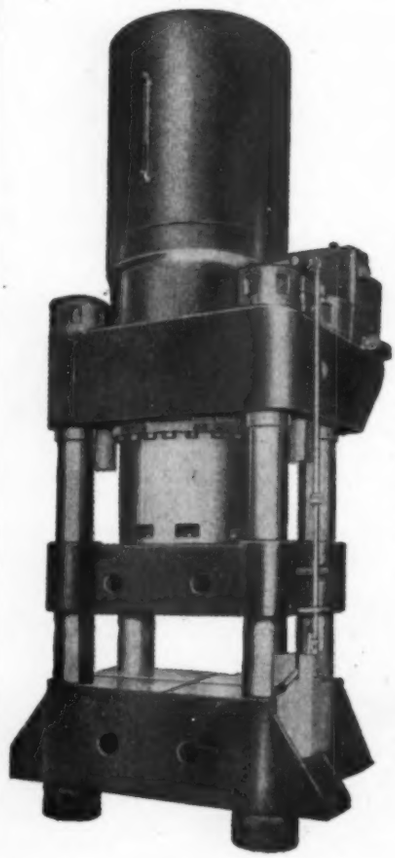

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600 TON ELMES PRESS

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16" x 24" x 72" Mattison Surface Grinder
6"x18" Norton Type "C" Plain Grinder
#2SL Lapointe Hydraulic Broach, 32" stroke
#4HS Cincinnati Plain Miller
#3HS Cincinnati Vertical Miller
#3-36 Cincinnati Bed Type Automatic Miller
#3, #4 and #5 Warner & Swasey Universal Turret Lathes

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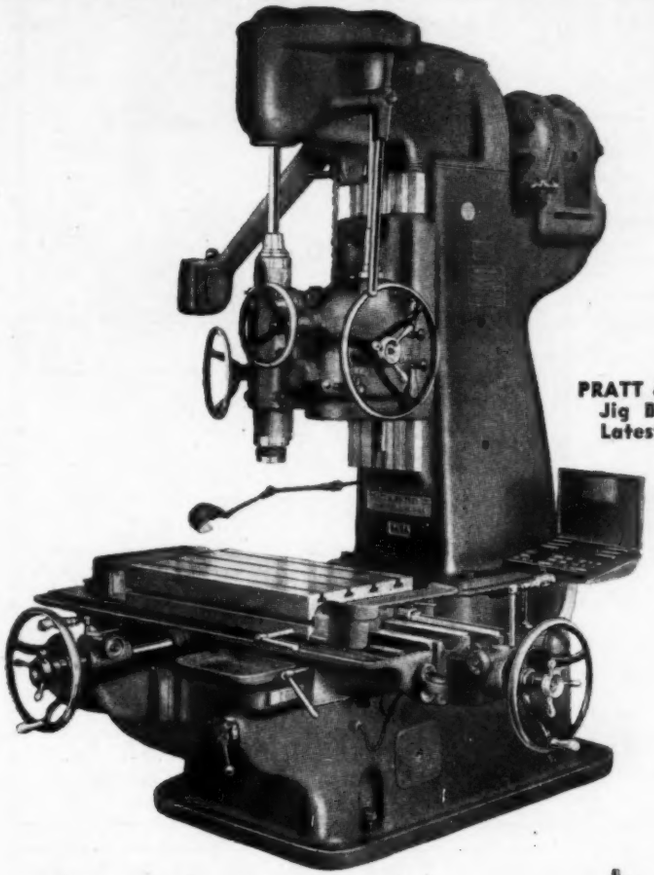


PRATT & WHITNEY 2A, 3B, Jig Borer, Motor Drive, Latest Type

AUTO. SCREW MACHINES
ACME GRIDLEY 2" Model RA 6-spindle
BROWN & SHARPE #4 High Speed, 1½"
CONOMATICS 3½"—4 spindle—latest type
CONOMATIC 2⅝"—6 spindle—latest type

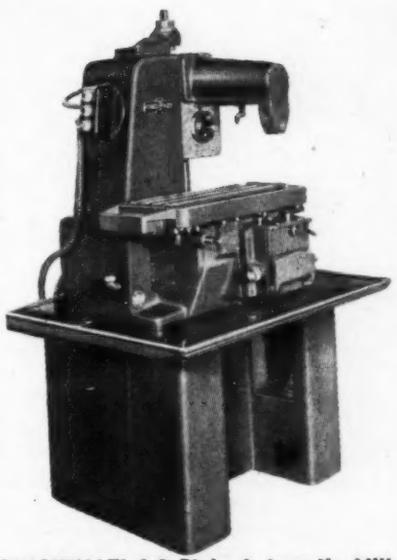
BORING MILLS—Horizontal
DETRICK & HARVEY 4", 5" bar, Floor Type
LANDIS #35, 3½" bar, Floor Type
NILES BEMENT POND 4½" bar, Motor Drive
NILES BEMENT POND 5", 6", 7" bar, floor
UNIVERSAL #3A—3" Bar, Motor Drive

BORING MILLS—Vertical
BETTS 120", 2 swivel heads, AC, M.D.
BETTS (Consolidated) 84"—3 heads, AC, Latest
BETTS (Consolidated) 100"—2 heads, DC, Latest
BULLARD 36" N E Type
KING 36" Vertical Turret, M.D., Latest Type
NILES 73", 2 swivel heads, PRT, AC, M.D.
NILES 100", 2 swivel heads, PRT, M.D.
NILES 120", 2 swivel heads, PRT, M.D.

GEAR CUTTING EQUIPMENT
BARBER-COLMAN type "A" Hobber, latest
BROWN & SHARPE No. 3H gear cutter, M.D.
FELLOWS #7, 7A, 72, 75A, 77, High-speed Gear Shaper, Latest Type
FELLOWS #615A, 645A3, High-speed Gear Shaper, Latest Type
GOULD & EBERHARDT 36H, 96H, with defferential
HERCULES 24" Hobber, differential, M.D.
PRATT & WHITNEY 10" Grinder, hyd., latest
SCHUHARDT & SCHUTTE #1, #2 with defferential

GRINDERS—Cyl.—Plain & Univ.
BROWN & SHARPE #1, 3, 4, Uni. Latest
BROWN & SHARPE #5 Plain, 3x12, Latest
LANDIS 6x18 Type "C", Fyd., Latest Type
LANDIS 30x226" Centers, Plain, Motor Drive
NORTON 16x72 Plain Type "C", latest type

GRINDERS—Surface
ARTER 30" Rotary Surface—Hyd.—latest type
BLANCHARD No. 16A—Dial Type—M.D.
BLANCHARD #16, 26" Chuck, Motor Drive



CINCINNATI 0-8 Plain Automatic Milling Machine, Timken, with Automatic rise and fall, Motor Drive, Latest Type

BLANCHARD #27-18 M.D., Latest Type
MATTISON 12x16x48 Hyd., Latest Type
MATTISON 14x16x60 Hyd., Latest Type
NORTON 10x36 Hyd., Latest Type
THOMPSON 16x30x48 Hyd., Latest Type

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BRIDGEFORD 36"x28', 36"x32' bed—M.D.
LEBLOND 17"x14' bed, Rapid Production, Timken Bearing, Latest Type
LODGE & SHIPLEY 16/20x30" Centers, Timken Bearing, Latest Type with extra Turret Slide Attachment
LOSWING 4x60, 4x84, 8x60, 8x108, Timken Bearing Latest Type
LOSWING 5x34" Model LR Auto., Timken
NILES—42x60", double head, motor drive
NILES 48x23', 32', 34', 35' Centers, Heavy Duty, 1 or 2 carriages, Timken Bearing, PRT, Latest Type
NILES 60"x10', 15', 35', 40', Centers, Heavy Duty, Timken Bearing, 1 or 2 carriages, Latest Type
NILES 30x50' Boring, Timken, Latest Type
NILES 36x24' Centers, Time Saver, Timken Bearing, PRT, Latest Type
PITTSBURGH 50'x30' bed—M.D.
REED PRENTICE 24x20' bed, AC, M.D.

LATHES—Turret
CINCINNATI ACME, No. 1, No. 5W, Timken bearing, latest type
GISHOLT No. 3D Simplimatics—Timken
GISHOLT #3, 4, 5, Univ., Timken Bearing, Latest Type
GISHOLT No. 4L 9" hole—cross sliding turret—Timken Bearing—latest type
GISHOLT #1L, #2L, Universal, Timken Bearing, Latest Type
LIBBY No. 1H-5 Timken Bearing—latest—5⅛" hole
MOREY No. 2G, No. 3, No. 4, Timken Bearing, latest type
WARNER & SWASEY #2, 3, 4, 5, Universal, Timken Bearing, Latest Type
WARNER & SWASEY #3A, Universal, 6¼" hole, bar and chucking, Timken Bearing, Latest Type
WARNER & SWASEY No. 4A Uni., 6¼" hole, Timken bearing, latest type

CINCINNATI 4-36, 56-90 Plain Hydromatic Milling Machine, Timken, Hydraulic, Latest Type

MILLING MACHINES—Mfg.
CINCINNATI 4-36 Hydromatic, Latest Type
CINCINNATI 56-90 Hydromatic, Latest Type
INGERSOLL 32x24x16' Planer Type, 2 heads, AC
INGERSOLL 48x12x16' Planer Type, 4 heads, AC

MILLING MACHINES—Plain
CINCINNATI #4, #4S, #5, Timken Bearing, M.D.
CINCINNATI #2, #3, Dial Type, Timken Bearing Latest Type
KEARNEY & TRECKER #2HL, #3K, #4K, Timken Bearing, Latest Type

MILLING MACHINES—Vertical
CINCINNATI #2, #4 Dial Type, Timken
CINCINNATI No. 3, No. 4 High-Powered, M.D.
KEARNEY & TRECKER 2K, 3K, Timken
REED PRENTICE 3VG Timken Bearing, Latest Type with Detroit Hydraulic Universal Duplicator

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CHANDLER 36x36x20', 4 heads, AC, M.D.
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NILES BEMENT POND 48x48x16', 2 heads, AC
OHIO 42x42x20'—2 heads, AC, M.D.

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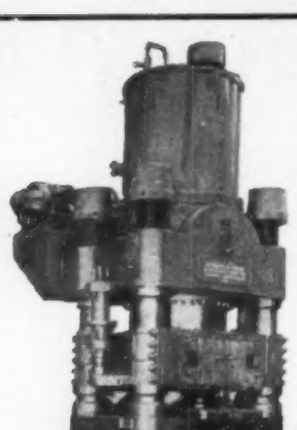

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L & S 18x12' & 20'x10' 20"x8' Grd. Hd. M.D. & 28"x12' Lathes Monarch Model "C"
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No. 1L Gisholt, chucking, Timken, hardened ways
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No. 2B Foster Universal, chucking
No. 2L Gisholt, chucking, Timken, hardened ways
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No. 2 Warner & Swasey All Geared Head, ram type, latest
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No. 3S Cincinnati Acme Fixed Center Universal, auto, chuck, latest
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No. 3A Warner & Swasey, chucking, Timken
No. 3 Foster Geared Head, bar, ram type
No. 3B Foster Universal, bar
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No. 4 Gisholt Universal, chucking, Timken, ram type
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No. 5 Warner & Swasey Universal, preselector head, latest
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2 spindle 3x36" Jones & Lamson Geared Head, chucking
3¼" Cincinnati Acme Geared Head, bar
3½x32" Jones & Lamson Geared Head, bar
18" Libby Type A, chucking
20" Acme Plain, cone
24" Gisholt, cone
26" Libby Type C, 7½" hole, chucking
26" Libby Type C, 4½" hole, chucking
28" Gisholt, cone

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Type A Barber-Colman, m.d., latest
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3' American Sensitive
3' Fosdick Sensitive
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6' American Triple Purpose, m.d. on base
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No. 7 Fellows, m.d.
No. 7A Fellows, m.d.
No. 13LS Fellows Lapper, m.d.
No. 18 Fellows Finisher, m.d.
No. 61 Fellows, m.d.
No. 64-S Fellows, m.d.
No. 615A Fellows, m.d., latest
No. 645A3 Fellows, m.d., latest
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6x18" Landis, m.d.
6x30" Cincinnati Hydraulic, m.d.
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No. 11 Brown & Sharpe Self-Contained
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8x18" Cincinnati Saddle Type, m.d.
8x36" Cincinnati Saddle Type, m.d.
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10x36" Cincinnati Hydraulic, m.d.
10x48" Landis Type C Hydraulic, m.d., latest
10x72" No. 16 Brown & Sharpe, belt
10x72" Landis Self-Contained, m.d.
12x36" Landis Self-Contained, m.d.
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12x48" Modern, belt
12x96" Landis Self-Contained, m.d.
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No. 73 Heald Airplane Cylinder Hydraulic, m.d., brand new, latest
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12x36" Cincinnati, belt
12x48" Norton, m.d., latest

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No. 11 Blanchard, 16" chuck, m.d., latest
No. 16 Blanchard, 26" chuck, m.d.
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No. 2 Leland & Gifford Hydraulic, m.d., latest
No. 3 Motor Avey, latest
No. 5M—16" Fosdick, m.d.
2, 3, 4 spindle No. 2 Avey, m.d.
2 spindle 21" Canedy-Otto, No. 4 Taper
4 spindle type MA6 No. 2 Motor Avey, latest
4 spindle Delta, latest
4 spindle No. 2 LMS Leland & Gifford, latest
6 spindle No. 3 MA6 Avey, latest

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No. 262 Barnes 2 spindle, latest
No. 3 Baush, 15 spindles
C13 Natco, 6 spindles
D13H Natco, 6 spindles
3 spindle 12" Rockford Gang
4 spindle Foote-Burt Rail
No. 16 Fixed Center Foote-Burt

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No. 1B—50" Pratt & Whitney Deep Hole, latest
No. 1 Pratt & Whitney Deep Hole
No. 1½x105" Pratt & Whitney Deep Hole, latest
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5 spindle Detroit Semi-Automatic, belt

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No. 242, 262 Barnes, m.d., latest
21", 24" Cincinnati-Bickford, with tapper
21" Fosdick, with tapper
28" Cincinnati-Bickford
30" Rich H.D.
32" Aurora, belt
H#3 Barnes Hydram, m.d.
D4, D8 Colburn H.D.
No. 25 Foote-Burt
No. 36HO Baker, m.d.

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1—Le Blond 21"x18', Heavy Duty Eng. Lathe, M.D., sw. over bed 21¼" dist. betw. cens. 153", mtzd.—Good Condition.

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1—Fay & Scott 16"x32", ext. gap. Eng. Lathe, adjust. hed., motor driven.

1—Putnam 30"x16', 18 speeds Eng. Lathe.

1—Bridgeford 36"x22', 9 speeds, motor driven Eng. Lathe.

HOR. BOR. MILLS

1—Lucas #43 Precision Hor. Bor. Mill, M.D., tbl. 36"x72", spin. diam. 4½", dist. from spin. nose to face of tailstock 84".

1—Giddings & Lewis #0 Hor. Boring Mill, knee type, diam. of bar 3⅛", 16 spin. speeds.

1—Niles #72 Duplex control, Horiz. Miller, M.D., 4½" bar.

VERT. BOR. MILLS

Bullard 24" and 36" New Era Type (2) 36" Spiral Drive Vert. Boring Mills.

GRINDERS

Mattison Hyd. Surf. Grinder, with mag. chuck, 18"x24"x72", power raise and lower to vert. hed. New 1942, Cond. Excel.

Blanchard #11, 16 and 18 Vertical Surface Grinders with 16", 30" and 36" magnetic chucks.

1—Conomatic 8 spindle—1⅞" capacity—vintage 1945.

PLANERS

1—Putnam 84"x84"x40' Dbl. Hous. Planer, Revers., M.D. and controls, 2 heds on cr. rail, 2 side heds., just taken out of service.

1—Cin. 78"x56"x22', Planer, M.D., rap. trav., 2 heds. on cross rail, 2 side heds. "Herringbone Gear."

Cin. 30"x30"x12', 2 heds. on crossrail, "Herringbone gear", rev. motor drive, rap. trav.

1—Amer. Fndry. & Mach. Co. 30"x30"x10', 1 hed. on cross rail, 1 side hed., Openside Planer, M.D.

MILLERS

Cin. No. 5 plain rect. overarm high power Miller, tbl. wkg. surf. 79"x21" power long. feed 50", cross 13", vert. 21".

Cincinnati #2MH Plain Hor. (Late type) 1200 RPM Tbl. Wkg. surf. 49"x10½" long range 28", cross 10", vert. 19".

MISCELLANEOUS

1—Farquhar 100 Ton Hydraulic Press—Daylight 48", stroke 36", approach and return speed 1600' per min.—given max. variation 15%, wght. 44,000 lbs. elect. equip. 440/3/60. (Condition equal to new.)

1—P. & W. #BL Keller duplicating machine—very late type—excellent condition.

P. & W. 6"x48" Thread Miller arr. for multi V-Belt motor drive, rapid trav.

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Botwinik Brothers of Mass., Inc.

3 SHERMAN ST. • WORCESTER 1, MASS.

LATE TYPE TOOLS

#2MH Cinci. Univ. Miller 1944
#3SP Van Norman Miller 1942
Nos. 2, 3, 4, Cinci. Vert. Miller '42, '45
#2, 3, 4 & 5 W. & S. Univ. &
#3 J. & L. Univ. Turret Lathes
#712 Fellows Gear Generator, 1942
36H & 48H G.&E. Gear Hobbers
30" x 15' centers Amer. Super Pro. Lathe
18" raised to 24½" x 192" centers, BB
Model Monarch, Carr. P. R. T., '42

BENNETT MACHINERY CO.
30 Church St. N. Y. 7, N. Y.

Late Model Machines

Comparators, 14" J.&L., Model 20 Doall.
Dust Collectors, Torit, 1/3 HP. 3/60.
Grinder, #13 B. & S., 3/60/220-440 V.
Grinder, #2 Cin. Tool & Cutter, 3/60.
Grinder, #91-C. Coval Tool & Cutter, 3/60.
Grinder, 6x18" Landis, Plain Hyd., 3/60.
Grinder, 10x24" Landis Univ. Hyd., 3/60.
Lathe, 608 Rivett, BB; BG; QCG; TA. MD.
Lathe, 9x24 Hardinge, CR, Collets, MD.
Lathe, 18-24½"x14' centers Monarch, QCG; MD.
Miller, 2MH. Cin. Univ., Vert. Hd. MD.
Shaper, 14" G. & E. Universal Tool, MD.

GALBREATH MACHINERY CO.
Empire Building Pittsburgh, Pa.

MACHINE TOOLS

Specials
Pratt & Whitney No. 2A Jig Borer
Gorton Vert. Millers and Duplicators
Gorton No. 3Z engraving machines
Milwaukee No. 2HL, B. & S. No. 2 Vert, swivel head
Doall Grinder with Selectron

BORING MILLS

#0 Giddings & Lewis arr., M.D.
2½" Cleveland arr. M.D.
2½", 4" Binsee
66" Niles; 54" Colburn, M.D. 2 hds.

TURRET LATHES

W. & S. Nos. 3, 4, 5 Grd. Hd, Univ. Preselector
Gisholt No. 1L, 2L Univ. M.D.
Foster Nos. 4, 5, 6, 1B, 3B M.D. Univ.
J. & L. 2¼"x24", 3¼"x36", #3.
Acme #2 M.D.

GRINDERS

#25 G & L, Grenby 1-2 Int.
#25A Heald, M.D. like new.
No. 2 Cincinnati Centerless M.D.
B. & S. No. 2, 2B Surface, M.D.
P. & W. 14", B.B., Vert. M.D.
Blanchard 30", M.D.; Modern 12x48" M.D.
Norton Hydraulic 12x18", M.D.
Heald Nos. 72A3 Gagematic
Norton 50"x28', M.D. Roll Grinder
Landis Type A 6x20" Hydraulic, M.D.
No. 55, 60, 65 Heald int., M.D.
12" Heald Rotary, Arter 12" M.D.
B. & S. No. 10 11 Cyl.
B. & S. No. 1, 3 Universal
Norton 6x18" Hyd. Surface, M.D.

LATHES

16"x8', 10"x3' South Bend, M.D. Late.
Monarch, Hendey 12x30 geared head, Late
26x12' Boye & Emmes 3 step cone D.B.G.
14"x6' Hendey, Taper, Collets
9" LeBlond, P&W Auto.
36x30' Putnam M.D., 36x22'
32"x35' Wickes, M.D.
Putnam 42x16', M.D. S.C.G.
20"x19', 20"x30' Boye & Emmes Grd. Hd.,
LeBlond "Regal" 16"x12', Grd. Hd., M.D.

AUTOMATICS

Cleveland Model A ⅞", 1¼", 2"; B 1", 2"
⅞" Cone 4 spindle, Gridley
B & S #0, No. 2 Hand Screw

New in Stock—Power Shears 52" and 72"
Spot & Arc Welders
5, 9, 14, 18 & 30 ton OBI Power Presses
7" Ammco Shapers
H.S. Vertical Milling Heads
Drill Presses, Foot Presses
Kalamazoo Metal Band Saws
8" Shape-Rite Shapers
No. 1½ Abrasive Surface Grinder
6x6" Racine Hacksaw
20 ton Northern Hydraulic Presses

RADIALS

4' Fosdick 13" col.
4', 5', 6' American Triple Purpose

MILLING MACHINES

6' Cinc-Bickford; 3½" Muller, M.D.
9J Gorton Vert., M.D., Duplicator
No. 1 Cleveland Vert.
#12, #22L Van Norman Univ.
#2B K & T Univ.; No. 2-2A B & S Univ.
#2HL Milwaukee, M.D. late
No. 3S Cincinnati, S.P.D. rapid trav.
Nos. 0Y, 2, 3, 4, 5 B & S Plain & Univ.
Hall Planetary Model D Thread Miller
Becker Nos. 3, AB, 5, 6, Vert.
Nos. 2, 3, 4 Cincinnati Vert.
P. & W. No. 12, 30" Profiler, M.D.
K. & T., B. & S., No. 2, 3
B. & S. No. 1, 3, Vert.
B & S #12 Elec. Prod. late type

MISCELLANEOUS

Buffalo #0 Angle Roll, M.D.
#20 Bliss OBI Power Presses
Gorton No. 1S Engraving Machine 3Z, 3U
Rochester No. 5⅛ B Hammer
6" Vertical Shaper, P & W
Oster Pipe Machines, 4", 6"
10x10 Peerless Universal Shaping Saw
#7, 72 Fellows Gear Shapers
Lennox Throatless shear ¼" cap., M.D.
Niagara & Pexto Power Shears
Deckel Engraving Mchs., G1, G2
11", Vernon Shaper, M.D.
17" Smith & Mills Shaper

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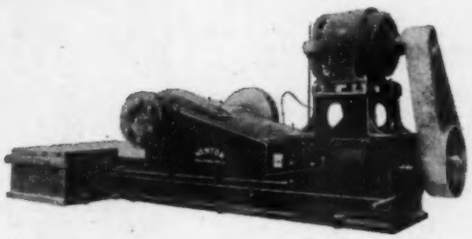
BORING MILLS

9" Bar BETTS Horizontal floor type, 50" face plate 6'—vertical travel, modern, 4-motors.
3" Bar Universal TRI-WAY Horizontal, P.R.T.
4½" Bar N.B.P. Table type.
24" New Era, BULLARD
54", 60" and 72" COLBURNS, two heads.
12' BETTS Extra Heavy double drive.
14' BETTS, Heavy, late type
16-24' NILES-BEMENT-POND, Extension Type, two swivel heads. AC or DC.
16' NBP 2 swivel heads.

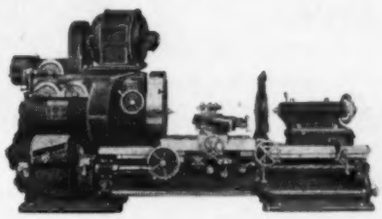
LATHES

24" x 13" AMERICAN 12-speed, G.H.
25" x 10' LEBLOND G.H.
27" x 22' REED PRENTICE G.H.
30" x 18' AMERICAN 12-speed, G.H.
30" x 23' AMERICAN 12-speed, G.H.
36" x 40' AMERICAN 16-speed geared head.
42" x 34' LEBLOND late type, 27-speed, G.H.
48" x 40' SIMMONS, geared head.
48" x 45' NILES, 16-speed, G.H.
60" x 27' NILES, 24-speed, G.H.
90" PUTNAM Driving Wheel Lathe with journal truing.
3-AL GISHOLT, Hardened Ways.
27" #2H-8 LIBBY, Hardened Ways.

Write today for Complete Current Stock List of Simmons *Engineered-Rebuilt* Machine Tools



60" NEWTON Cold Saw Cutting-off Machine, capacity: Round 20"; Square 18"; Travel of Saw Carriage 34"; AC or DC motor drive.



36" x 40' (32' Centers) AMERICAN 1-Speed Geared Head Lathe, AC or DC motor drive.

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ENGINEERED Machine Tool REBUILDING

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AUTOMATICS, 3½" Cone 4-Spindle (4)
AUTOMATIC, 1⅞" Cone 4-Spindle (2)
BOLT CUTTERS, No. 22 Murchey, Dble. Hd.
BOR. MILLS, 2½" bar, Cleveland, M.D.
BORING MILLS, 3" bar Universal.
BORING MILL, Hor. 3½" Landis, Floor Type.
BORING MILL, 36" Bullard, "New Era".
BORING MILL, 40" King, 2 heads, M.D.
BROACH, Hr. Hyd. XA Oilgear, 60" stroke.
BROACH, Vert. Hyd. SRV5-42" LaPointe.
DRILL, Hvy. Duty, No. 513 Baker, No. 6 M.T.
DRILL, Radial 6' Cinc.-Bickford, M.D.
GEAR SHAPER, #75 Fellows, M.D.
GRINDER, Internal, No. 72A5 Heald, 2 Mtr.
GRINDER, Plain, 14"x72" Norton
GRINDER, Plain, 24"x240" Norton, M.D.
GRINDER, Surface, No. 6 Abrasive, 14"x48".
GRINDER, Surf. Hyd. G & L. 14"x18"x72"
GRINDER, Surface, No. 25 Heald Rotary
HAMMER, Board Drop, 1,000#, B. & S.
HOISTS, Monorail, 3 ton, Detroit, D.C.
LATHE, 24"x16' B & E Grd. Hd.
LATHE, 27"x18' Niles "Timesaver," Grd. Hd.
LATHE, 30"x22' N-B-P, Grd. Hd., Q.C.G.
LATHE, 36"x19' Putnam, Grd. Hd. Q.C.G., T.A.
LATHE, 42"x50' Putnam, Grd. Hd.
MILLER, Duplex 24" Cincinnati, Auto.
MILLER, Plain, No. 3B Milwaukee, S.P.D.
MILLER, Plain, Nos. 3S, 4 & 5 Cincinnati.
MULT-AU-MATICS, Bullard, Type A, 6-Spdle.,
PLANER, Openside, 36"x36"x12' Cleveland
SHAPER, 32" Gould & Eberhardt, M.D.

PARTIAL LIST

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TOP PERFORMANCE AT LOW PRICES

#16 Bliss Horn Press, MD
#44P Toledo Horn Press. Arr for Geared MD
#77 Toledo Gap Frame Press, Flywheel Belt Drive
1⅝" Greenlee 6 Spld. Automatics, 1941
#1—P R & K OBI Press (2)
1¾" Model F Gridley Automatic, MD some tooling, good shape.
10"x36" NORTON PLAIN HYDRAULIC GRINDER, 1941, 5" face wheel
#2 Jackson Vertical Mill
No. 2 Brown & Sharpe Universal Mill, M.D.
#1B Milwaukee Plain Mill, M.D.
11"x5' Sebastian Gold Seal Lathe GH, T.A., Motor in base
16"x6' Hendey Dry Geared Head Lathe TA, MD and controls

All these are but a partial listing. Your inquiries for any Metal Working Equipment are welcomed.

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LONG BED ENGINE LATHES

All Geared Head

2—PUTNAM 42"x34' Bed. Motor Driven (One with taper attachment)

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NEW and USED—Hand and Power Brakes, Shears, Forming Rolls, Folders, Punches, Rotary Machines, Stakes, Spot and Arc Welders.

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18" Landis Pipe Machine, M.D.
No. 13B & S Grinder, belt
No. 2 B & S Surface Grinder, M.D.

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Late Model MACHINE TOOLS AVAILABLE

BORING MILLS

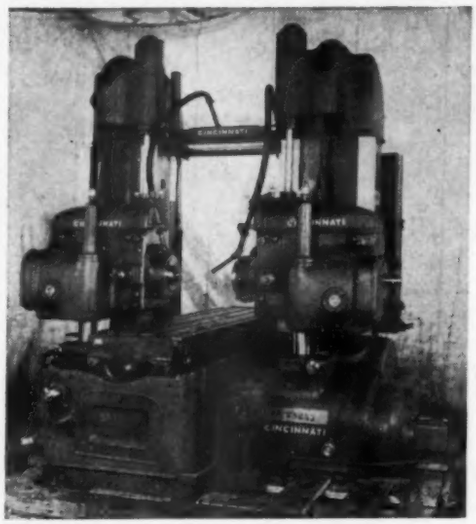
36" BULLARD Vert., M.D.
42" BULLARD Vert., M.D.
3½" bar GILBERT Table Type Horiz., M.D.
#25-C DEFIANCE Table Type, M.D.
#360-F GIDDINGS & LEWIS, Floor Type, M.D.
#560-F GIDDINGS & LEWIS, Floor Type, M.D.

GRINDERS

#10 B & S Tool & Cutter, M.D.
#72A3 HEALD Plain & Sizematic, M.D.
#4T SELLERS Tool Grinder, M.D.
9" P & W Hyd. Gear Grinder, M.D.
#5 B & S Plain Grinder, M.D.
10"x72" HILL-CLARKE (Norton) Grinder, M.D.
14"x168" NORTON Type "C" Plain, M.D.
#11 BLANCHARD Rotary, 16"x20" chucks.
30"x24"x16' MATTISON Surface Grdr., M.D.

LATHES

12"x30" LODGE & SHIPLEY G.H. Lathe, M.D.
14"x30" LODGE & SHIPLEY G.H. Lathe, M.D.
12"x30" MONARCH Model "C" Lathe, M.D.
32"x324" centers LEBLOND LATHE, T.A., M.D.
42"x61' centers AMERICAN "SUPER PRODUCTIVE," M.D.
50"x17' centers LEBLOND "BIG SWING" Lathe, M.D.



#5/60 CINCINNATI, Duplex Hydromatic Milling Machines, tracer control mechanism for automatic rise & fall of spindle carriers, M.D., one machine used six months—one new—never used.

MILLING MACHINES

#2G KEMPSMITH All Geared Univ., M.D.
#2MS CINCINNATI Dial Type, Plain, M.D.
#4MS CINCINNATI Dial Type, Plain, M.D.
#3MS CINCINNATI Dial Type, Vert., M.D.
#3HS CINCINNATI Dial Type, Vert., M.D.
#3K KEARNEY & TRECKER Vert., M.D.
#4 CINCINNATI "HI-POWER" Vert., M.D.
#5H KEARNEY & TRECKER Plain, M.D.
#1H-12 KEARNEY & TRECKER MFG., M.D.
#M-50A TAYLOR & FENN Vert., M.D.
#12-M MOREY 2-spdle PROFILER, M.D.

RADIAL DRILLS

3'11" AMERICAN "HOLE WIZARD," M.D.
6'17" FOSDICK "ECONOMAX" M.D.

TURRET LATHES

#0 B & S Wire Feed Screw Machines, M.D.
#2 W & S Ram Type Univ., M.D.
#3 W & S Ram Type Univ., M.D.
#4 W & S Ram Type Univ., M.D.
#3 J & L Ram Type Univ., M.D.
#1A W & S Saddle Type Univ., M.D.
#2A W & S Sadle Type Univ., M.D.
#3A W & S Saddle Type Univ., M.D.

MISCELLANEOUS

32" OHIO Heavy Duty Shaper, M.D. (1942)
6"x48" THOMPSON Broach Grinder.
#36BM GOULD & EBERHARDT 3-spdle Gear Rougher
#4½ BLISS S.S. Double Action Press, M.D.
3/16"x96" CHICAGO Power Squaring Shear, M.D. (1942).
1½" Double Head LANDIS Threading Machine, M.D.

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Daylight Time—On the Premises

LATHES, SCREW MACHINES. Carroll-Jamieson Motor Driven Quick Change Geared Head Engine Lathe, 16"x8'; South Bend, Atlas, Wade, Waltham and Cataract Motor Driven Bench Type Lathes; 2 New Britain Gridley Model 61 Motor Driven Automatic Screw Machines; 5 Davenport Model B Automatic Screw Machines; Gisholt No. 5 Motor Driven Turret Lathe.

GRINDERS. Brown & Sharpe No. 13 Universal Tool and Cutter Grinder; Persons-Arter Rotary Surface Grinder; Sterling Universal Tool Grinder; 2 Kent Motor Driven Surface Grinders; Diamond Surface Grinder; Van Norman No. 3 RE-LI-O Grinder; Sanford Bench Type Surface Grinder; Black Diamond Size 2 Precision Drill Grinder; Atlas-Cincinnati Motor Driven Bench Type Double End Grinders.

SHAPERS, DRILLS, MILLERS, PLANERS. Smith and Mills 16" Motor Driven Back Geared Shaper; 2 Havir Shape-Rite 8" Motor Driven Shapers; 18 Walker-Turner 15" Bench Type Motor Driven Drill Presses; 4 Walker-Turner 15" Floor Type M. D. Drill Presses; 6 Electro Model 101-M Bench Type Motor Driven Drill Presses; Taylor High-Eff and Dumore Bench Type Drill Presses; 2 Nichols M. D. Hand Milling Machines; 3 B. & S. No. 0Y and 1Y Horizontal Plain Millers; Knight Vertical Miller, Whitcomb and Morse Tool Room Planers.

MISCELLANEOUS. American Extractor, Portable Arc Welders, Arbor Press, Air Compressors, Testers and Readers, Vises, Small Tools, Electric Portable Drills and Grinders, Factory Equipment, Office Furniture, etc.

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LATE TYPE MACHINE TOOLS

1—#30 Fosdick Jig Borer with micrometers, indicators, 18" rotary table, telescoping gages, and large quantity of tools.

1—#2-H South Bend 16x6 Turret Lathe

3—#EMS Hardinge Precision Turret Lathes

1—#1 Brown & Sharpe Universal Grinder

2—#2 Kempsmith Motor Driven Milling Machines

1—150 Ton Rodgers Hydraulic Arbor Press (NEW).

1—#5-60 Cincinnati Duplex Milling Machine

1—16x72 Norton Cylindrical Grinder

1—#2K KEARNEY & TRECKER Vertical Milling Machine

1—#4K KEARNEY & TRECK Vertical Milling Machine with Rotary Table

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24" Bullard Vertical Turret Lathe
24" x 24" x 6' Gray Planer
5'-14" Fosdick Radial
3'-9" Cincinnati-Bickford Radial
#2 Acme Full Universal Turret Lathe
#2 Acme Semi-Universal Turret Lathe

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QUALITY *Machine Tools*

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28" x 60" CINCINNATI Vertical Hydrotel Milling Machine: Single spindle, with profile tracing attachment, motor driven. Latest model.

14" x 16" x 60" MATTISON Surface Grinder: Motor driven, with hydraulic table traverse, coolant equipment. Latest model.

AUTOMATICS
★ **9/16" RA-6 Acme-Gridley Automatic Screw Machines. Bar equip. New in 1943.**
2⅝" RA-6 Acme-Gridley, New in 1943.
1½" & 1⅝"—8 Spindle Conomatic, New in 1942.
5½" Cleveland Model A, single spindle.
16" x 33" Fay Automatic Lathe.
⅞" Cleveland Model M, four spindle.

BORING MILLS
No. 31 Lucas Horizontal, m.d.

BROACHES
LaPointe CPC 24, Hyd., Vertical. New in 1945.

DRILLS
★ **28" Cincinnati-Bickford Super Service Drill, box column type, with flanged quill unit, motor driven. Latest model.**
4' Canedy-Otto Radial Drill. New in 1946.
No. D2 Colburn, single spindle.
No. 314 Baker, single spindle.
42" Cincinnati-Bickford.
★ **No. 3B-12 Edlund, four spindle, back gear and semi-auto. power feed, m.d. New 1944.**
★ **No. 2LMS Leland Gifford Single spindle drill, with hand-hydraulic spindle feed, motor driven. New in 1943.**
★ **No. 3 Baush Multiple Drill, 20 spindle, No. 2 Morse taper, rectangular head 20" x 40".**

GEAR CUTTERS
No. 3 and No. 12 Barber-Colman Gear Hobbers.
No. 61 Fellows Gear Shaper, m.d.
No. 7125 and No. 715 Fellows Gear Shaper, m.d.
6" Gleason Str. Bevel Gear Generator.
★ **No. 3616 Cleveland Rigidhobber, spur or spiral gears to 42" diameter x 16" face, m.d. New in 1943.**

GRINDERS
No. 22 Heald Rotary Surface Grinder.
No. 16-26" Blanchard Surface Grinder.
No. 72A3 Heald Sizematic Intern. Grndr.
No. 72A3 Heald Gagematic Intern. Grndr.
6 x18 Cincinnati Cylindrical. New in 1943.
10 x 36 Norton Cylindrical. New in 1942.
No. 13 Brown & Sharpe Universal & Tool.
★ **No. 2 and No. 3 Cincinnati Centerless Grinders, with Filmatic Spindle, some with through feed rest, others with in-feed; m.d. New 1940-1941.**
★ **Model B Thompson Hydraulic Surface Grinder, 10" x 24" capacity. New in 1942.**

LATHES, ENGINE
10" x 20" Monarch EE Toolmakers Lathe. Latest model.
12" x 30" Pratt & Whitney, g.h.
14" x 6' Sebastian, motor in base.
16" x 6' Hendey, g.h.
★ **22" x 72" Monarch CM Lathe, flame hardened ways, anti-friction taper attachment. New in 1944.**
24" x 12' Monarch helical, g.h.
48" x 12' Lodge & Shipley, c.d.
IMP and LR LO-Swing Lathe, m.d.
15" x 30" Lipe Carbo-matic. New in 1943.
17" x 50" LeBlonde Production, m.d. New in 1942.

LATHES, TURRET
No. 4A Warner & Swasey, g.h. New '42.
No. 3A Warner & Swasey, g.h.
No. 1A Warner & Swasey, g.h. New '43.
No. 4 Gisholt, Univrsl., g.h. New in 1943.
No. 3 Warner & Swasey, g.h. New 1943.
No. 1 Bardons & Oliver, c.d.
No. 1 Brown & Sharpe, m.d.
No. 6D Potter & Johnston.
36", 42" Bullard VTL, New Era.

MILLS
No. 26 Van Norman, ram type, swivel head, new in 1943.
No. 3 Cincinnati Universal, motor in base, rectangular overarm.
No. 4 K & T Milwaukee Plain. New in 1942.
No. 4B Brown & Sharpe Plain, m.d.
No. 2 MH Cincinnati Plain, m.d.
No. 2 H Milwaukee Vert., motor in base.
No. 2 Cincinnati Vertical, motor in base, new in 1943.
No. 2209 Milwaukee Mill, table 22"x158".
No. 3-36"Cinci. Hydromatic Duplex, m.d.
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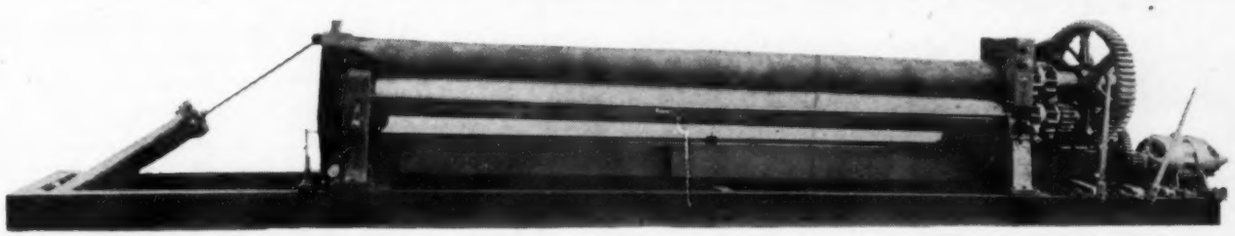

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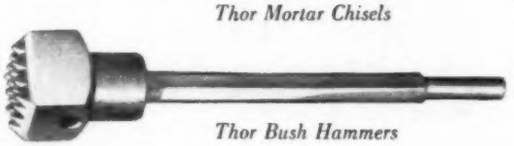

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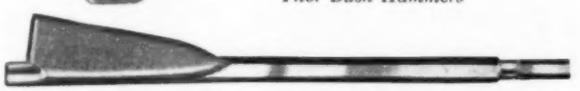

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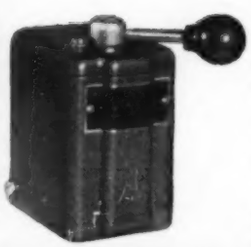

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Tests are more Reliable WHEN THE OIL IS Centrifuged

A DE LAVAL Oil Purifier enables test oil to be used over and over again with complete satisfaction and safety. By means of centrifugal force, it removes dirt or metallic particles from the oil, and if any moisture has found its way into the oil, it will remove and continuously discharge it. The test oil thus is kept clean and dry . . . hence maintains its usefulness longer.

De Laval machines need not be large on test oil purification. The model above has only moderate capacity—sufficient for the quantity of oil in the transmission test stand, of course. But De Laval Oil Purifiers are provided in a variety of sizes, so that whatever the capacity requirements, De Laval can meet them most efficiently.

Purification of test oil is but one of many time- and labor-saving applications for De Laval Oil Purifiers in metal-working plants. Bulletin MM-1 lists several others. Write for your copy.

DE LAVAL
PURIFIERS AND CLARIFIERS FOR FACTORY OILS

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GREATER OPERATING EFFICIENCY

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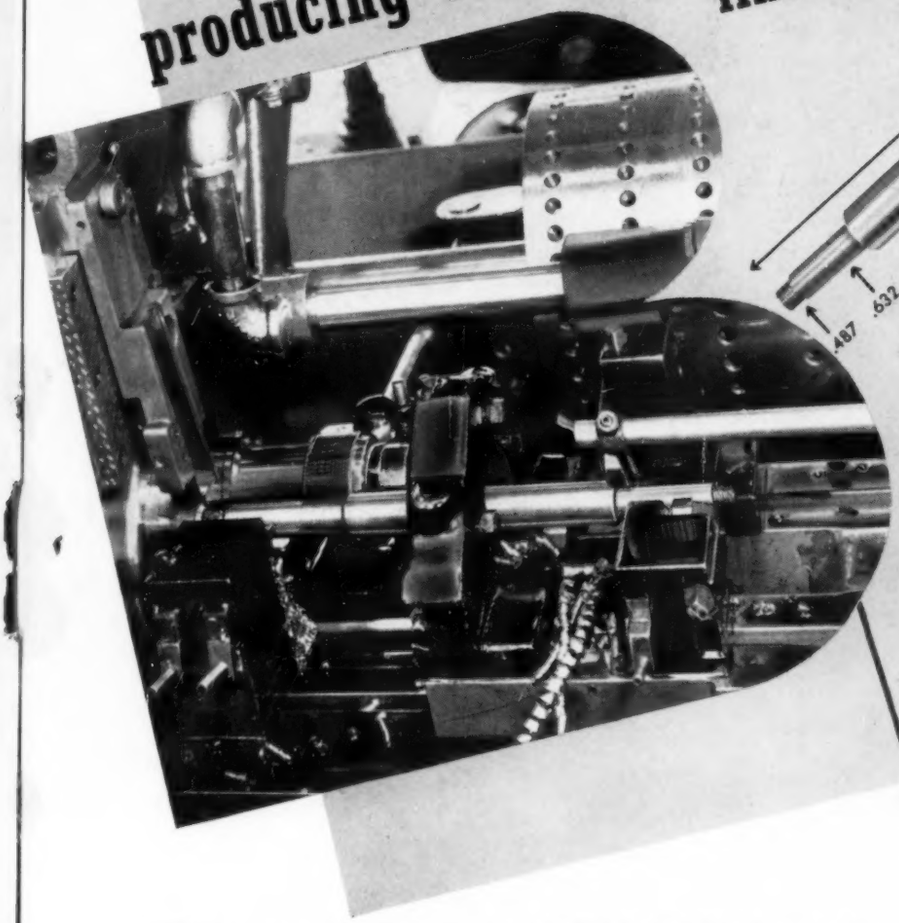
"Puts the Bee" on costs of producing Multiple Diameter Shafts like this



CLEVELAND MODEL B 18" SHAFT MACHINE automatically turning and forming rotor shaft for fractional hp motor.

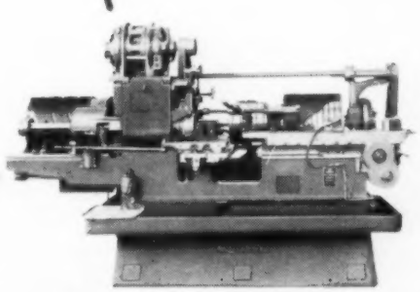
Operation sequence: Milling slide—steady with 3-roll rest on stock diameter; turn .632 diameter. At the same time, front slide forms in, and cross turns .978, .802, and .765 diameters. Rear slide under cuts and forms serrations on .802 diameter; breaks-down at rear of piece; breaks-down for cut-off; chamfers, undercuts and serrates .487 diameter of next piece. The cut-off is made with the independent cut-off attachment.

MACHINE TOOL SHOW CHICAGO SEPT. 11-26

FOR THE HIT OF THE SHOW
SEE CAMCO
BOOTH No. 510

CLEVELAND MODEL B SHAFT MACHINES are designed for automatic production of long armature and transmission shafts, spindles, studs, bolts, etc. Made in 1½" and 2½" capacities for delivering pieces up to 18 inches, with multiple OD, shoulders and chamfers, plus one end working operation.

For this purpose, no more practical machine can be found from the standpoint of initial cost and economy of production. If your production involves work of this type, it will pay you to investigate Cleveland Model B Single Spindle Automatics. Write today for bulletin giving complete information. Remember, Clevelands cut costs!



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Accurate preloading to any desired degree is possible due to the basic Timken bearing provision for "take up". Maximum support is provided by the line contact between tapered rolls and races. The bearings themselves are precision products, made to exactingly close tolerances. They *retain* this precision indefinitely due to scientifically-correct design; "Generated Unit Assembly" (eliminating need for re-adjustment); and the finest material ever developed for tapered roller bearings—Timken alloy steel. Result: chatter-free performance, maximum rigidity and long-life precision under all speeds, feeds and cutting loads.

Remember, no other bearing can bring you *all* the advantages you get with Timken bearings—backed as they are, by 49 years of bearing research and development. That's why it's so important to make sure you have Timken bearings in every machine tool you manufacture or buy. The Timken Roller Bearing Company, Canton 6, Ohio.

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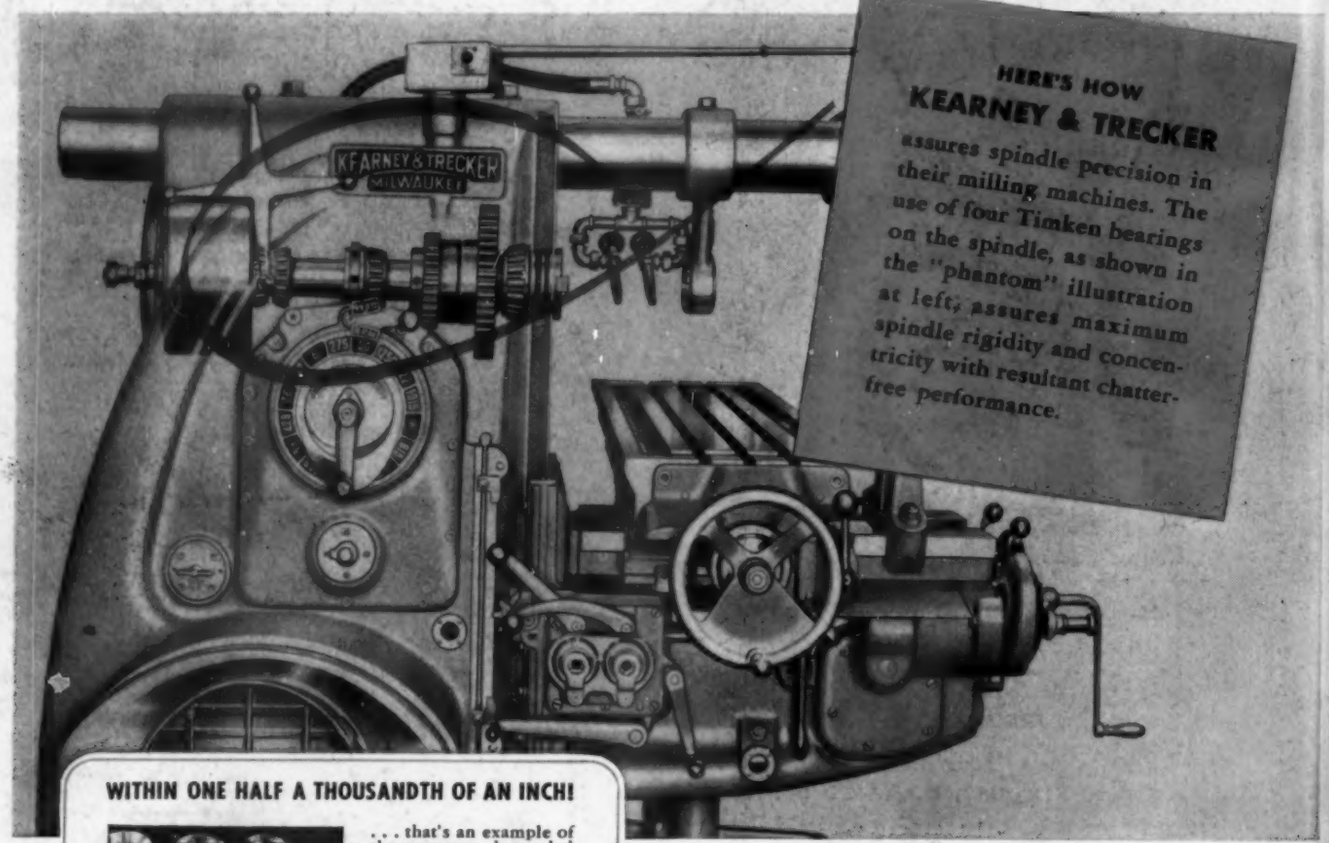
This symbol on a product means its bearings are the best.



HERE'S HOW KEARNEY & TRECKER

assures spindle precision in their milling machines. The use of four Timken bearings on the spindle, as shown in the "phantom" illustration at left, assures maximum spindle rigidity and concentricity with resultant chatter-free performance.

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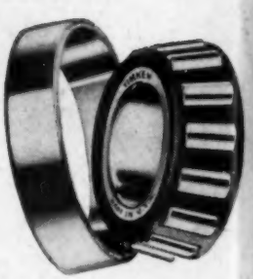

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